American Machinist

OCTOBER 9, 1935

One labor authority says that 90 per cent of those who think they are learning a trade are, in fact, learning only a small fraction of a trade. "America has produced more half-baked mechanics than any other country in the world"

WILLIAM F. PATTERSON
Executive Secretary, Federal Committee on Apprentice Training

WANTED: BROADER TRAINING

AS INDUSTRY shakes off the depression it faces a new difficulty. Skilled labor supply has been materially depleted.

Unable to work at their trades, large numbers of skilled workmen have established themselves on farms or in businesses. Immigration restrictions have stopped the flow of trained craftsmen from Europe. Death and disability regularly take a large toll. New industries, new processes, new machinery, new materials require great numbers of skilled workers and at the same time create much obsolescence among craftsmen, particularly since the pre-depression period was characterized by over-specialization. Old-age benefits and pension systems will increase the retirement rate in the future. There has been a five-year moratorium on training young men.

The answer to the problem, many executives are coming to believe, is systematic apprentice training on a nation-wide scale. This is not only in the interest of American industry but in the interest of American youth —which has suffered severely during this depression.

The country has paid dearly for its preponderance of half-trained workmen. That fact added materially to the extent of unemployment. From the apprentices of today are drawn the inspectors, the foremen and the executives of tomorrow. It is imperative, therefore, that apprentices be selected with the greatest care; that their training be broad and thorough and that care be taken to turn out good citizens as well as good mechanics.

Particular attention must be paid to the probationary period in apprentice training if these broad objectives are to be attained. Study of scores of cases shows clearly that it is disastrous for all concerned to embark a youth upon a career for which he has no special aptitude. Industry gets half-trained men—and the man finds steady employment hard to get if he is not fitted to his job, or if his experience is in too narrow a groove.

E. H. Ballard, of the General Electric Company, tells of a situation in that company's turbine department which demonstrates the value of broad training for the apprentice. The superintendent was short of operators on large machine tools. He had to put on a second shift. In the tool and die department were a large number of men who were working every other week. Many of those tool and die workers were graduate machinist apprentices. They had not been working on large tools but their early training had grounded them sufficiently so that they could take over those jobs and, in a very short time, produce a satisfactory output.

Even in a highly specialized shop it is possible to provide the necessary training to make an all-round mechanic. Take the experience in a highly specialized foundry with a con-

American industry is confronted with the paradox of a shortage of thoroughly skilled labor at a time when millions still are out of employment. Systematic apprentice training on a nation-wide scale is needed to cure the trouble. Broad experience during probationary period is essential; can be supplied even in the smaller specialized shops

tinuous pouring turntable making agricultural implement castings, for example:

"We are developing apprentices in our highly specialized foundry," its chief executive writes. "We cannot give them loam work, but we can give them small floor, bench work and core work. Our boys are getting a foundation. They are getting the ground work of general foundry practice which can be used in jobbing shops in our locality.

"It is perfectly possible in a highly specialized shop to develop apprentices into good all-round mechanics, capable of functioning successfully in any kind of shop. Our apprentices entered the national contests sponsored by the American Foundrymen's Association in pattern making and gray iron castings. Every year one or more of our boys has taken prizes in both pattern making and gray iron castings in competition with apprentices from all parts of the country. This shows that the training in our specialized shops was complete and broad enough to give the boys a thorough general skill. Apprentices will hold their own if they are trained honestly and conscientiously and given a chance."

More and more individual manufacturing executives are coming to realize the influence of general trends on their own particular operations. Even those industries which have gone far in constructive apprentice training activity, are beginning to urge the need for extension of such programs to as large a number of industries as possible.

Quite evidently, there has been too much tendency in the past to funnel apprentices into a few of the more prominent skilled occupations. Hundreds of new industries are springing up. Air conditioning, airplane manufacture, oil-burner production and a host of other manufacturing fields require workers specially skilled in some of their relatively new processes.

Some old trades, moreover, are coming back. When repeal brought a sudden demand for barrels and kegs, it was impossible to find anything like an adequate amount of skilled cooperage labor. In an effort to meet the situation a large number of old men, some of them over seventy, returned to the trade from which they had been forced to retire eighteen or twenty years ago. Increased use of horses during the depression developed the fact that harness making had become a lost art.

There is a great temptation in any shop when it is working under pressure to keep apprentices on the jobs they know when journeymen are not available. To guard against this the agreement between the apprentice and the employer may well provide that there must be diversity in the novice's training. For instance, a schedule being used by one plant for machinists is as follows:

Length of apprentice period: four years.
Probationary period: first three months.
Schedule of processes to be learned: small drill press, simple jig work, two months.
Upright drill, on lay-out work, two months.
Horizontal drills, miscellaneous work, two months.
Plain milling machine work, production work, two months.
Plain milling machine work, two months.
Universal milling machine, two months.
Shaper, six months.
Engine lathe, twelve months.
Planer, six months.
Miscellaneous machines, three months.
Vise floor work, six months.
Toolroom, three months.

Adequate safeguards can be established to prevent any overcrowding in particular skilled crafts. The matter of the number of skilled workers needed in a trade can effectively be determined by a local advisory committee composed of an equal number of employers and employees functioning under the auspices of the State Committees on Apprentice Training. These groups will be provided with the necessary statistical data to enable them to keep the situation in balance at all times.

This is only one of the minor ways in which this Federal Committee on Apprentice Training, originally set up in June, 1934, is developing its services along practical, commercial lines.

"Where, Oh! Where"

E. C. (EDDIE) BRANDT
Westinghouse Electric & Manufacturing Company

Last week, at the National Machine Tool Builders' Exposition in Cleveland, I saw four million dollars worth of machines under their own power that were certainly a realization of many a mechanic's dream. It took me back to the days when my Dad and I were discussing "where" and "how' I could learn a trade of some kind, and it was finally decided that a machinist's or toolmaker's trade offered the greatest possibilities.

The years that have elapsed since I served my apprenticeship have seen the development of the finest operating and producing equipment which mechanics of this modern ago could devise. But then I say, in capital letters, "WHERE, OH! WHERE HAS MY WONDERING BOY GONE?", and "WHERE, OH! WHERE HAVE THE SKILLED MECHANICS GONE?'

As I see this entire situation, with all of the mechanical possibilities as displayed at the Machinery Exposition, this is going to be America's next great call. Surely industry must establish mechanical training courses for practical knowledge along with technical training, far beyond anything we have ever experienced before, especially when the manufacturing equipment users are going to take full advantage of the possibilities of such modern machinery as was shown at this Exposition.

The only way Industrial America is g ing to stop the cry "WHERE, OH! WHERE, HAVE THE SKILLED MECHANICS GONE?" is for the American industrial managers to cooperate with the American fathers and also answer the question, "WHERE, OH WHERE, HAS MY WONDERING BOY GONE?" Take him into our industrial plants, establish, or re-establish our mechanical training courses, and put practicability into Industrial America, where it has been for a great many years and has only faltered during this readjustment period, which we hope is over now.

Let us all try and be a party to creating in our young men the love for labor saving equipment, whereby we shall elevate our social standing, and secure greater prosperity for our nation.

One of its major aims is to help industrial executives to develop needed skilled workers along sound lines indicated as desirable by industry's own experiences, a few examples of which have been mentioned in previous paragraphs. Considerable impetus to the ability of the Federal Committee on Apprentice Training to serve industry in this manner was given recently when the National Youth Administration designated it as the agency for carrying on the apprentice phase of the N.Y.A. program.

A Cooperative Agency

Study of the formal objectives of the Federal Committee on Apprentice Training, in fact, reveals an interesting picture of the broad industrial implications of the apprentice training problem in general as well as the aims of this particular cooperative agency. Its purposes are to:

a. Supply guidance and act in an advisory capacity to and in cooperation with all agencies concerned with apprentice training.

b. Furnish detailed literature containing information which will be of value to parties promoting and conducting apprentice training and in drafting schedules of training for all known skilled occupations.

c. Contact executives at headquarters of corporations which have establishments in more than one state for the purpose of developing uniform training standards.

d. Work with national trade associations and national labor organizations to secure their support and cooperation.

e. Safeguard the interests of apprentice training in orders or policies which may be adopted in the future. The matter of voluntary agreements and government contracts is still being discussed and whatever form of decision is reached this committee will make certain that the matter of apprentice training is given thorough consideration.

f. Provide for a method whereby a government certificate may be issued evidencing the completion of apprentice contracts.

g. Keep those vitally concerned informed of commendable apprentice training activities in other areas and in other fields.

h. Publicize such information as may be of interest and help in promoting a nation-wide program of apprentice training.

The committee works through state committees. Those committees have been organized in 43 states. They handle such matters as: providing related instruction; drafting terms of training; determining of hours of labor and wages; outlining schedules of training and issuing diplomas. They organize state and local advisory committees; assist all concerned with apprentice training and protect and promote the cause of apprentice training. Proper apprentice training can be had only when all those agencies and groups which have a vital stake in it cooperate whole-heartedly. While centuries of experience have demonstrated that manipulative and hand-skills can be learned best on the job, modern industry requires an understanding of related technical knowledge. For this reason school training is a definite requirement of the program.

Each state committee has an employer and an employee member. Another member represents the Department of Labor of the state. Another represents the state board having jurisdiction over vocational education. The representative of the United States Employment Service sits as a member of the committee, as does the state youth administration director. The federal committee is made up of a representative of the Labor Department; of the National Youth Administration; of the Office of Education; of the National Industrial Recovery Board; together with a representative of employers and of the employee. In the board, as now constituted, the employer member is C. R. Dooley, manager of the Industrial Relations Department of the Standard Oil Company of New York. The employee representative is John P. Frey, president of the Metal Trades Department of the American Federation of Labor.

Advisory Committees

Schedules of training, which should be uniform in each community, are worked out by trade advisory committees. These committees also decide the number of apprentices to be absorbed. The federal committee simply acts as a technical adviser. It is in no sense a super organization running the program. There is nothing compulsory in the plan. The federal committee is interested primarily in encouraging apprentice training, not in a few selective industries, but broadly throughout industry and then in securing the adoption of an organized program that is most likely to be effective.

Underwood & Underwood Studios

WILLIAM F. PATTERSON

is a native of Wisconsin. He was graduated from the University of Wisconsin in 1920, where he specialized in labor economics. He served as an assistant in the Milwaukee Employment Office and later as an assistant in the office of the State Supervisor of apprentice workers. He then became director of guidance and placement at the Milwaukee vocational training school. He served for a time in industry as manager of industrial relations for the Yates American Machine Company, Beloit

The federal committee has assembled the results of experience in other countries. It continues to keep closely abreast with the best practice both in this country and abroad. It is a clearing house for comment, criticism, and advice. The movement simply is a manifestation of the government's recognition of the plight of American youth. To be successful it must have the cooperation of all concerned. It is purely voluntary on the part of the employer. A business-like plan must be evolved that will appeal to him if he is to provide the wherewithal for this learn-while-you-earn program. It must have the hearty support of the employees as they are the teachers in the shop. School teachers must cooperate because book learning is a very important part of the plan. Parents also have an important role in helping make the selection of the trade for which the youth is best fitted.

METAL SHOW MARKS NEW MILESTONE

Displays at Chicago reflect notable advances in materials, heat-treating and welding as a result of improved mill practice and better metallurgical control

JOHN HAYDOCK

Managing Editor, American Machinist

LAST WEEK, at Chicago, the metal-working industry witnessed a fitting supplement to the Machine Tool Show. Bigger and more varied in scope than any of its predecessors, the seventeenth National Metal Exposition reflected credit on the four sponsoring technical societies.*

Over 200 firms, 25 per cent more than last year, displayed their wares at the International Amphitheatre. Occupying over 164,000 sq. ft. of floor space and showing equipment valued at $2,000,000 they formed Chicago's largest exhibit since the Century of Progress.

The Metal Exposition dealt primarily with the metals themselves and their metallurgical processing as distinguished from the Machine Tool Show where machining methods were the central theme. Materials on display at Chicago included steels of all kinds, tool, stainless, heat resistant and other alloy steels, non-ferrous metals, cast irons, heat-treating supplies, such as carburizing compounds, quenching oils and salts, cleaning compounds, plating supplies, lubricants and cutting oils. Equipment exhibits covered heating furnaces of all descriptions, furnace control instruments, testing apparatus, welding and brazing equipment, cleaning and finishing equipment and some metal-working machines.

Visitors were sure to be impressed with the recent strides in metallurgy. No longer is steel just steel or hardening a simple heating to a "cherry red" followed by a quench. Steel is literally a thousand different alloys each developed to have specific properties for specialized service. Heat-treating is fast becoming an exact science with all conditions carefully controlled to bring out certain characteristics and to repress others. Welding, too, is yielding to scientific approach and is rapidly finding a wider field of usefulness.

Among the more pretentious exhibits was that of the Union Carbide Company which occupied an entire end of the arena section. In its booth were housed displays by three of its subsidiaries: Linde Air Products, Haynes Stellite and the Electro Metallurgical Sales Corporation. Linde's exhibit featured a newly designed Oxweld shape cutting machine with control of speed and flame both at the torch and at the tracing table. Built with machine tool ruggedness this machine has an aluminum tracing arm much resembling the ram of a shaper. It is arranged to cut straight lines or angles with or without the use of a templet.

Haynes Stellite demonstrated the cutting ability of its product by a J-metal tool in operation on a steel bar while held at a red heat by means of two oxy-acetylene torches. In addition many examples showed the possibilities of hard facing with Stellite welding rod to improve wear resistance of such parts as valve seats and press dies and high nitrogen ferrochrome were shown by Electro Metallurgical. The inclusion of the new commercial element columbium in stainless steels is claimed to maintain high strength and ductility which eliminates intergranular corrosion.

**American Society for Metals, American Welding Society, the Institute of Metals and Iron and Steel divisions of the American Institute of Mining and Metallurgical Engineers, and the Wire Association.*

W. H. Eisenman, secretary American Society for Metals, watches the Air Reduction Company's shape cutting demonstration

Furnaces Are Improved

Atmospheric control is the keynote of furnace design as reflected at the Metal Exposition. Furnaces are now considered more as chemical retorts than mere heating mediums. Proper adjustment of furnace gases eliminates scaling at the source and if desired the work will leave the furnace bright. If needed a carburizing atmosphere can be produced within the furnace.

General Electric had a brazing furnace in operation equipped with a control equipment which preburns city gas to supply an inert atmosphere to the

electrically heated work chamber. Temperature was controlled by a radiation tube pyrometer, developed jointly by G. E. and Leeds & Northrup. This device entirely eliminates the thermocouple, always difficult to calibrate in a controlled atmosphere. The G. E. exhibit included many examples of bright annealed and furnace brazed parts.

Improved refractories have contributed to gas furnace design. The present practice is to use a continuous insulating refractory backed by block insulation to obtain better fuel economy and more even temperature within the furnace. Burner roar is reduced and uniform heating obtained by the use of larger numbers of small burners instead of a few large units.

In gas furnaces atmosphere is controlled either by so regulating the flow of fuel and air that the products of combustion will give the condition desired, by partial combustion outside the furnace chamber or by completely burning the atmospheric gases and using additional burners for heating. These various means are employed to provide atmospheres for bright annealing, clean hardening, deoxidizing or gas carburizing as required.

In general the aim is to reduce heat-treating costs and at the same time improve the quality of the product. Continuous furnaces are gaining popularity. This type was exemplified at the Exhibition by the rotary retort heating machine made by the American Gas Furnace Company, which is especially suited for hardening, carburizing and clean annealing small parts. This concern also had in operation a reciprocating muffle type heating machine. Both these units were provided with atmosphere control. Another development is the American over-fired high-speed oven furnace, vented at the bottom to eliminate chimney action and the infiltration of air.

The Surface Combustion Corporation had on display a number of furnaces incorporating its DX unit for producing controlled atmosphere from either manufactured or natural gas. It also showed its Radiant Tube construction wherein the gas is burned within a series of tubes and heats entirely by radiation without entering the work chamber. Carburizing by means of gaseous atmospheres eliminates the use of packing and compounds together with a saving in furnace space.

Leeds & Northrup showed a Homo tempering furnace and a Hump Vapocarb furnace. The Homo furnace on display was a late development de-

New ASM President

R. S. ARCHER

New Vice-President

E. C. BAIN

signed particularly for extra dense loads such as small bolts or rivets. These pack into the basket rather tightly and as this type of furnace depends on a current of hot air for heating, provision must be made to insure circulation to all parts of the load. That this was accomplished was demonstrated by six thermocouples distributed throughout the load and attached to a six point recording pyrometer.

Control Instruments

This concern also demonstrated its radiation tube pyrometer, mentioned in connection with the G. E. exhibit. Originally developed in the steel industry for measuring the temperature of billets or other large steel pieces, the tube is being introduced for general temperature measurement. It can be hooked up to the standard Micromax controlling recorder which has undergone refinements of construction.

Air operated controllers under the trade name Air-O-Line were displayed by the Brown Instrument Company. These instruments have a wide range of utility as they may be employed to control either temperature, pressure, flow or liquid level. In temperature control, for example, the company's usual potentiometer hook-up is made by the actuating medium for valve operation of air instead of electricity.

Another Brown development is an automatic optical pyrometer called the Optimatic. Its operation depends on the photo-electric cell and it may be used with a recording instrument. This company's Protectorglow system has been recently redesigned with warning light signals to show when the ignition is on, when the pilot is lighted and when the motor valve is open. This system protects against pilot failure where highly combustible mixtures are used.

A brand new entry in the control field is the Wheelco system offered by Thermo Control Devices, Inc. This arrangement eliminates all mechanical parts, being entirely dependent on electronic tube action. A split control coil is set on the instrument opposite the temperature reading desired and a flat metallic disk on the potentiometer arm enters this coil when the furnace reaches this temperature. This causes a rise in the plate current in the tube which operates a sensitive relay.

The Bristol Company has added to its line a wide strip pyrometer, operating on the potentiometer principle. This concern has also introduced the Pilotrol, a device for shutting off fuel supply when pilot lights are out or preventing turning on of the main supply before the pilot is lighted. Another Bristol development is a thermocouple protection well called Briscrome.

In addition to the Linde shape cutting machine, already described, a number of new developments in this field were exhibited by the Air Reduction

Sales Corporation. One of these was a bar stock cutter capable of cutting bars up to 12 in. in diameter. An acetylene torch is fed across the bar automatically and stops automatically. It was said that a 4-in. bar could be cut in 70 sec. by this method. Another new piece of equipment in this display was the beam cutter. This consisted of two torches, one of which is fed across the flange and the other across the web of an I-beam. Straight or angular cuts may be taken as desired.

In the electric welding field one trend is the introduction of smaller units for the job shop or for the sheet metal shop. These are portable, inexpensive and highly convenient for light welds.

An example of this equipment was the 150-amp. a.c. welder offered by Westinghouse. By a plug-in arrangement the current on this unit can be varied in step from 30 amp. up to capacity. Westinghouse also showed a newly designed 500-amp. welder in which the current could be adjusted from 100 to 500 amp. This unit has an automatic cut-off so when the arc is broken the current stops. Breaking of the circuit is delayed long enough for the operator to strike another arc if he is continuing to work but if he lays the holder down any change of accident is prevented. Current is restored by a switch on the handle.

Lincoln Electric Company's booth showed its line of "Shield-Arc" welding equipment and a complete line of accessories. Daily demonstrations were given of the electric arc in action on a wide variety of metals. Two new Lincoln electrodes "Toolweld" and "Abrasoweld" were used. Among the accessories was a water cooled carbon electrode holder and a welder's protective shield, both of new design.

In the 75- and 150-amp. sizes, Hobart Bros. showed their redesigned d. c. arc welder. These units have built-in control panels and are known as their "turret-top" design.

Steel Exhibits

The steel companies did much to make their booths interesting and attractive. Jones and Laughlin used as a background a 15-ft. working model of a blooming mill. Bethlehem had two working models, one of its wheel heat-treatment department and one of its bar electric heat-treatment department. Republic had a miniature farm display, showing steel applications in the agricultural industry, and a model of an oil well drilling rig. Youngstown Sheet & Tube used a small scale 79-in. hot continuous mill in its exhibit.

Beneath all this display could be seen a definite trend to produce better characteristics at low cost. Alloy high-tensile steels have long been known but now there is a move to offer compositions having many of the properties of steels sold to a quality market and still low enough in price to find wide application. Such steels are now offered by practically all makers and meet the demand for increased strength and decreased weight specified in so many modern designs. These are alloy steels but by careful control at the mill the desired strength is obtained by small amounts of comparatively cheap alloying constituents.

Another trend is away from heavy shapes to lighter construction using tubes and strips. The steel displays showed many examples especially in the field of transportation where excess weight often reduces the pay load. Free machining steels are being given more attention. Stainless steels were shown in a great variety of uses.

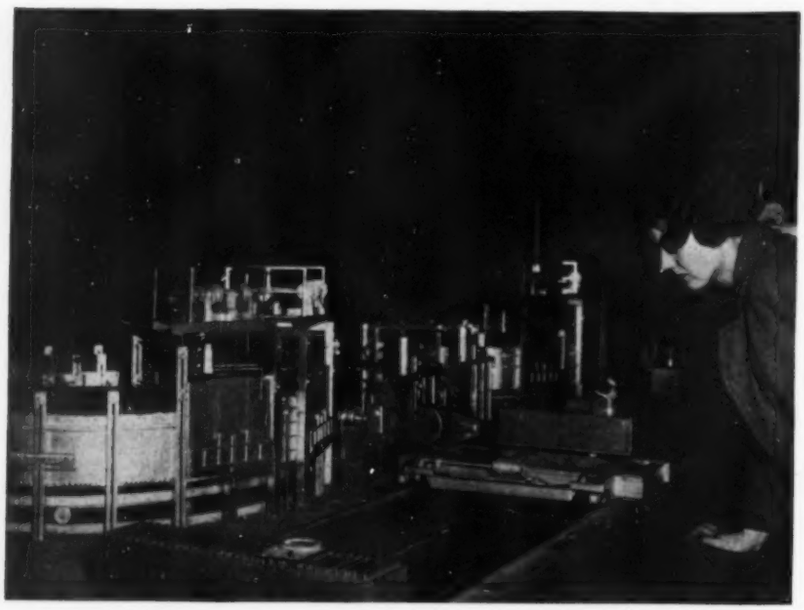
Aside from the major fields of heat-treating, welding and steels themselves the Metal Exhibition included such a wide variety of products as to preclude description in one article. To mention only a few, the Udylite Company showed a small plating unit for the job shop or for small batches in large plants. Another development by Udylite is the humidified buffing wheel.

The Chapman Valve Company had an attractive display of Chapmanized products together with one of its furnaces and a series of charts comparing this process to nitriding and carburizing. Carboloy showed hard facing applications and its new diamond impregnated wheel dresser.

The EFH cut series of extra pressure cutting oils were on display by E. F. Houghton & Company. Norbide, the Norton Company's name for its boron carbide was a feature of its well rounded exhibit of abrasives. A line of bench tools and collets of Hardinge Bros., including the inclosed head models, were shown. The Hoskins Manufacturing Company display centered on Chromel, the heat resisting wire. Harnischfeger had a new electric hoist for light work. The Magnaflux Corporation demonstrated its powder for detecting flaws in steel parts.

And so on through a long list of companies and their products. But there were visitors interested in all of them—visitors who wanted to know about these products for use in their own plants. Exhibitors everywhere were delighted with the genuine interest shown and the large volume of orders taken.

Of the meeting sessions the high spot was the address of William A. Irwin, president of the United States Steel Corporation at the A.S.M. annual banquet. Charles A. McCune, director and secretary, Magnaflux Corporation, was awarded the Samuel Wylie Miller memorial medal by the American Welding Society for his pioneering in the development and application of fusion welding.



Bethlehem's working model of its R.R. wheel heat-treating department showed the work being charged into the furnace, transferred to the quench, then loaded into the annealing furnace and finally being placed in the cooling pit

SAFETY—EVERYBODY'S JOB

When plants engaged in hazardous operations establish a safety record it's a sign that "Safety First" is more than a slogan

E. S. SMITH

Manager, Die Division, Fisher Body Corporation

A GROUP of plants that establishes an accident severity rate of 0.7 per cent should receive due credit. That the group includes shops engaged in the heavy work incident to automotive and tool manufacture makes the record all the more remarkable.

Detroit continues to be outstanding in the extent to which the men who carry forward all of the industrial functions (from sweeping factory floors to directing great groups of plants) appreciate their mutual interest in the successful continuance of organizations of which each is a necessary part.

At Fisher Body much confidence is placed in the benefits obtained from the practice of stopping all work for ten minutes every Tuesday morning, and gathering in groups for discussion of safe practices. These groups vary in size from 25 to 50 men and are under a rather loose chairmanship of the various sub-foremen.

The chairman, or discussion leader, brings safety statistics of the plant and of general industry to the attention of his group. He opens topics for discussion, notes and takes proper action on suggestions pertaining to safety or to working conditions. His success does not lie so much in the amount of safety teaching that he can impart in ten minutes, as in his ability to encourage all members of the group to contribute ideas and suggestions.

No doubt these group meetings sometimes drag, but we do not believe that there has been a total loss of ten minutes for each member of the group. The regularity with which these meetings occur every Tuesday, week in and week out, has had a psychological effect on those participating in them that has been akin to the constant dripping of water on a stone.

The superintendent of non-productive labor takes the responsibility for safety inspection. He has authority to call on anyone in the organization to help him in that duty. He has educated the force of watchmen to be safety inspectors and holds them to continuous responsibility for noting and reporting unsafe conditions or practices. The duty of safety inspector has not devolved on our superintendent of non-productive labor because of his particular position, but because of certain inherent qualities and capabilities of the man. At one time or another most of us have realized that he is using us as safety inspectors without having received appointment to a committee.

Presented before the machine shop section of the Detroit National Safety Council.

Material Handling

Among the routine inspections is that of systematic examination of chains and to make sure that all are annealed at regular intervals. Another is the observation of how dies and die parts are placed on horses. Our inspection routine also calls for continual check to see that goggles are being worn and that safety screens are set around jobs on which chipping or grinding operations are being performed.

Care in moving materials has also been given a good deal of attention. Each of our cranes has its selected "hookup" man who is trained and responsible for the proper slinging of every job that is lifted by his crane. He walks ahead of the moving load when the crane begins to travel, and warns people to look out for the moving mass. All loads are carried approximately 4 ft. above the floor. Drivers of electric trucks are trained to the rule that the pedestrian has the right of way.

The guarding of moving parts of machines and machine drives is the first step in any safety program. When we move a machine or install a new one, we consider the proper guarding of moving parts to be just as essential as providing the power to drive the machine. There never is a cheaper or more convenient time to install a guard on a machine than before it is put into operation.

Despite a somewhat inconvenient layout of the plant for first aid (most of the men must leave the building in which they work and cross a yard to reach the first aid room), we still believe that it pays to take the time required for treatment of minor scratches, cuts, bruises and abrasions.

In the distribution of goggles we have found that it is advisable to take the time and trouble to fit each man with a pair that does not cause him discomfort. We want him to cooperate with us by wearing them; we should do what we can to make it comfortable for him to do so.

Because some of our most severe accidents in the past have been due to flying parts of broken milling cutters, we now send all cutters to the heat-treating department once every three months. Normalizing of the cutters saves cutter breakage to the extent that the process is paid for, fewer cutters are broken, and there are fewer chances of an operator being struck by flying steel.

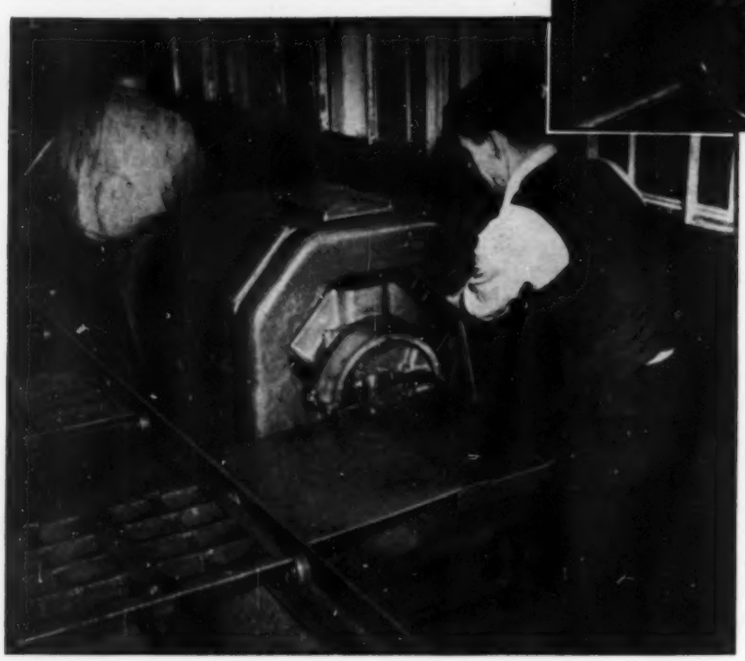
We have several hundred portable grinders. No amount of education can insure that safety washers will always be used properly in connection with the fastening of grinding wheels to the spindles. We have found it advisable to have the small-tool maintenance crew make a continuous job of seeing how the wheels are mounted and correcting the mounting when improperly done.

These are a few of the safety practices at Fisher Body. They serve to show how we are thinking in attacking the problem of making the industrial plant a safe place to work in.

TWO TENTHS in TWO MINUTES

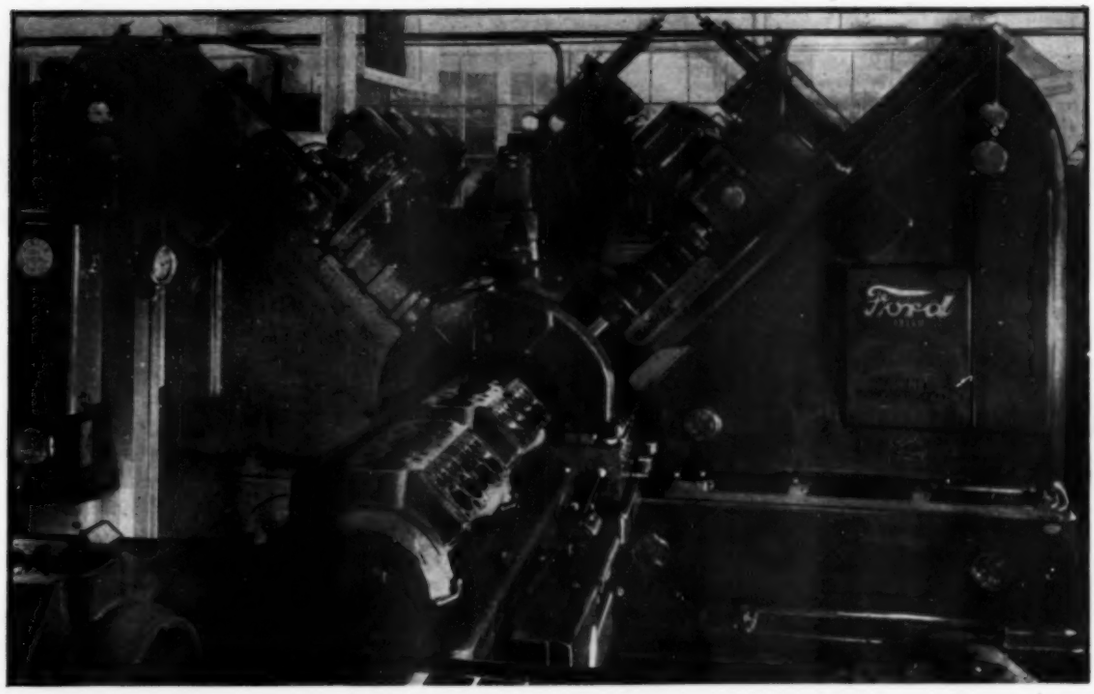
Microscopic accuracy in minimum time is found in the diamond boring operation on the Ford V-8 cylinder block. Bores are held within 0.0002 in. in size, eccentricity and straightness and are finished in 4 min. per pair of blocks

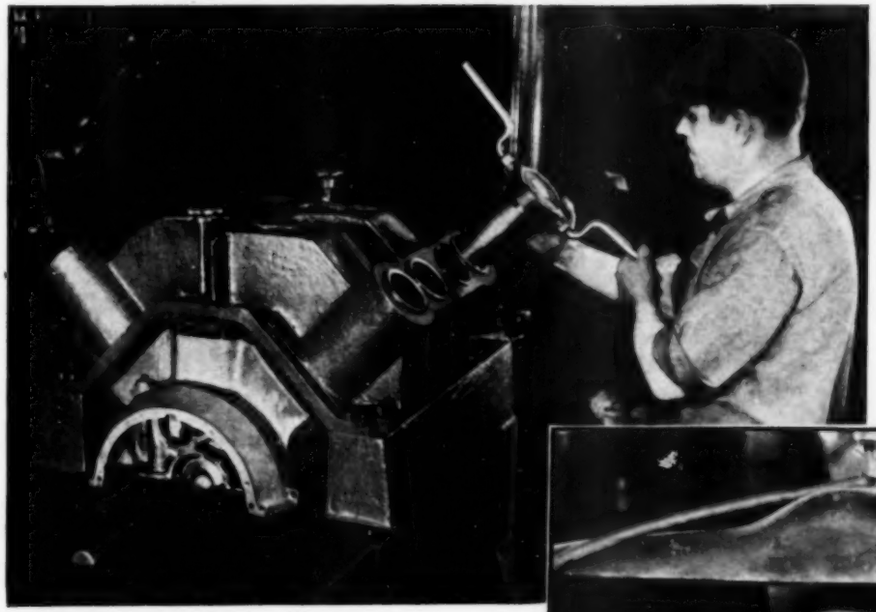
MAJOR H. C. DECKARD



Upper left—Roughing is done in less than 1¼ min., floor to floor time, on special four-spindle machines, with the block held in a cradle and indexed for the second bank of cylinders; ⅛ in. of metal is removed by piloted boring bars rotating at 108 r.p.m. Stellite cutters are fed 0.130 in. per rev. Above—The eight cylinders are semi-finished simultaneously on a fully automatic two-way machine. Cemented carbide cutters at 300 r.p.m. take off 0.0125 in. of stock. With a feed of 0.045 in. per revolution the time per block is 40 sec.

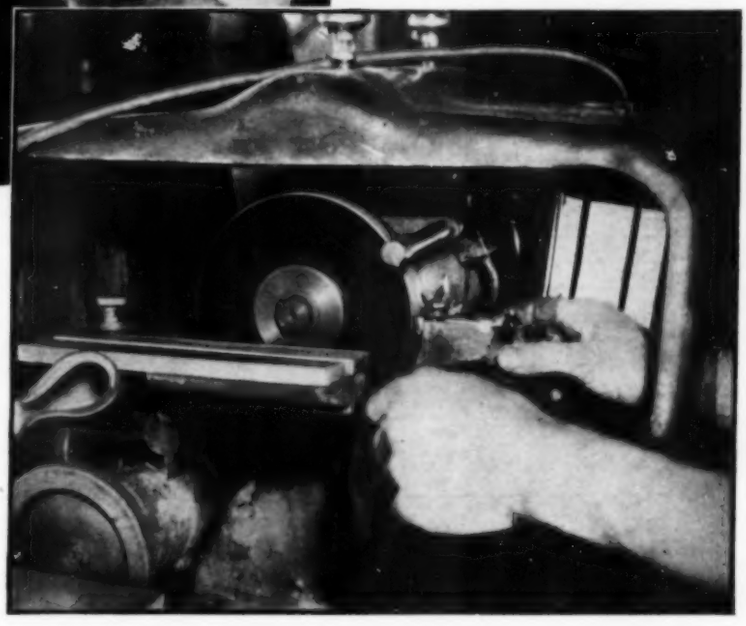
All tapped holes are cleaned of chips before the cylinders are finally finished. The machine for doing this has 143 nozzles, located over the tapped holes, which release compressed air and water





In diamond boring (actually tungsten carbide is used) two blocks are automatically pushed into position in the fixture. Clamping cylinders above exert a down pressure of 1,500 lb. on the blocks which are located on pins. Spindles are traversed to cutting position, taking alternate bores on the two blocks, and are then fed at 0.007 in. per rev. Metal removed is 0.014 in. With the cut finished, spindles recede and the blocks are automatically moved ahead 4 in. where the cycle is repeated. At 400 surface ft. per min. cutting points last for 500 bores between grinds

After having 0.00025 to 0.0005 in. removed with regular P-400-L stones, using kerosene as a lubricant, bores are inspected with a Johansson amplifying gage guided in long bushings. The indicating dial located in the center of the plug is protected against injury



Boring tool bits are sharpened on a 200 diamond grit wheel. After the form is ground on the center line of the wheel the bit is raised 0.06 in. and backed off. High polish is added by repeating the operation on a 500 grit wheel. The boring department is housed in a glass-inclosed, air-conditioned room

WELDS at WATERTOWN

Test methods on arc welds were recently described. How the results obtained were interpreted in terms of current production is given below

W. L. WARNER

Welding Engineer, Watertown Arsenal

GUN MOUNTS must be fabricated so they will withstand shock and vibration. The U. S. Army arsenal at Watertown faced this problem and improved its practice by a series of practical studies in arc welding. The design of the test pieces employed was described in the first article on this subject (*AM*—Vol. 79, page 721).

In Fig. 4 are shown the results of a series of tests made to determine the proper current for making a $\frac{5}{16}$-in. fillet weld on ¼-in. structural 3½ per cent nickel steel plate with a ⅛-in. bare low carbon electrode. The five weld sections and curves on the left side of the illustration, which pertain to the study, show definitely that a current between 110 and 130 amp. is most desirable. This range covers the peak of both the tensile and tensile impact curves. The test specimens used were as shown by Fig. 3 in the preceding article.

Three specimens were tested from each weld, and the points on the curves are the averages of the three test values in each case. It is interesting to note that with 150 amps., making the fillet in two layers (W7) produces a very strong weld, whereas, when the weld is made in one layer (W6), the strength is comparatively low.

While these test data are interesting in themselves, they become more so when considered in conjunction with the radiographs of the welds which are shown in Fig. 5.

The size of the illustration is such that considerable reduction was necessary in reproducing these X-ray films so that much of the detail was lost in the process. However, a careful study of the films shows that in weld W1 the current was too low, leaving a "penetration line" which indicates that the weld has not penetrated the root at all points along the joint. This condition has affected the strength of the weld which shows up on test.

Weld W2 shows no porosity or other defects and is a good weld. Increasing the current to 135 amps. (W5) begins to show a few fine gas pockets scattered through the weld metal, and this causes a slight drop in the strength of the welded joint. A further increase of the current to 150 amps. causes a porous weld metal (W6) and a further drop in the physical characteristics of the weld.

When the weld is made in two layers (W7), the speed of travel of the arc along the joint is, of course, greater, and the gas pockets do not have an opportunity to grow to the large size shown in the single layer weld (W6). Therefore, we find the weld metal full of small gas holes, quite uniformly scattered, and the effect of these holes on the strength of the welded joint is not noticeable.

Thus, with the physical strength curves for the $\frac{5}{16}$-in. fillet on the ¼-in. nickel plate and the radiographs W1 to W7, inclusive, we are in a position to establish definitely a working condition for the welder and a basis for procedure control by X-ray. The radiographs of various welds on the finished structure are compared with W2 and W5. From this comparison, it is quite easy to determine whether the welder has obeyed instructions or not and what he has done that he should not do. Were it not for some such basis as this, a check-up by a non-destructive test would be uncertain if not impossible. This method may be similarly followed in establishing other welding conditions.

It is also interesting to note the three fillet specimens at the right of Fig. 4 and the strengths of these welds (W9, W10 and W11) as shown by the curves above them. These are single-layer fillets made on ⅜-in. structural 3½ per cent nickel steel plate; the size of fillet and current are given under the curves.

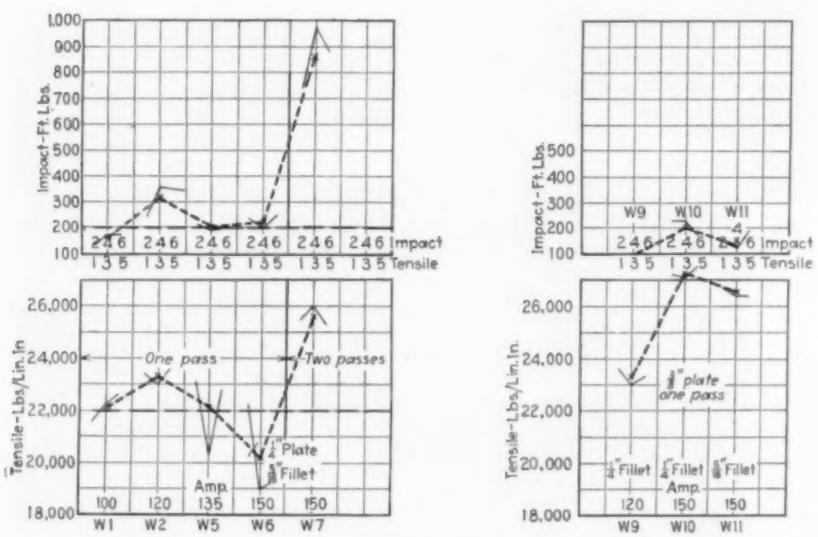


Fig. 4—Tensile and impact strength of fillet welds, transversely loaded, made on 3½ per cent nickel structural plate 0.30-0.35 per cent carbon with ⅛-in. low carbon bare electrode

If weld W6 and W11 are compared in Fig. 5, it will be seen that while W6 is very porous W11 shows a sound weld metal similar to W2. The only difference between weld W6 and weld W11 is the greater plate thickness of the latter, which results in a greater mass to absorb heat and a sound weld metal.

The difference in tensile values of welds W6 and W11 is considerably in favor of the latter. The tensile strength of W11 is even greater than that of W2 by a good margin. However, the tensile impact value of W11 is lower than that of either W6 or W2. Fracture of all specimens except those of weld W7 occurred through the weld.

It appears, therefore, that the tensile strength of a single layer fillet transversely loaded, or rather the transverse shearing strength is greater on heavy plate than on light plate. I have observed this characteristic in tests of ⅜-in. fillets in longitudinal shear on structural carbon steel plate, but the differences in weld strength between the light and heavy plate were not as great as in the present instance.

Stress Concentrations

It is believed that this difference in shearing strength of bare electrode weld metal on light and heavy plate may be caused by relative plastic deformation of weld metal and plate metal under load. Due to the low ductility and high yield point of the weld metal, the probability is that the lighter plate metal adjacent to the weld reaches its yield point and begins to deform plastically at a lower load then when the plate is heavier; the weld metal which is stiffer than the plate, carries a greater load and higher stress concentrations are built up, particularly at the ends of the fillets, resulting in a failure of the joint on the light plate at a lower total load than on the heavy plate. This principle, of course, applies to fillets of equal size and continuity on both plate thicknesses, when made with bare low carbon electrodes, and is particularly true when the fillet is tested in longitudinal shear where the weld failure is mostly progressive from the ends toward the middle.

The observed difference between the structural carbon and nickel steel in this respect may be due to the heat affected zone adjacent to the weld. On the nickel steel plate, this heat affected zone is considerably harder and less ductile, and the difference in hardness of this zone on the light and heavy plate is greater than for carbon steel. The heat-affected zone has a tendency to resist deformation and prevent progressive weld failure under static or slowly applied load. Therefore, it is reasonable to expect a greater difference in fillet shearing strength on the nickel plate where the difference in hardness of the heat affected zones is greater than on the carbon plate.

These heat affected zones are detrimental to good impact properties in some proportion to their hardness. Therefore, one would expect a lower impact value on the heavier plate by reason of the greater hardness of the heat affected zones adjacent to the fillets. This actually occurs, as we have seen from the data shown in Fig. 4, and applies to fillets of equal size and

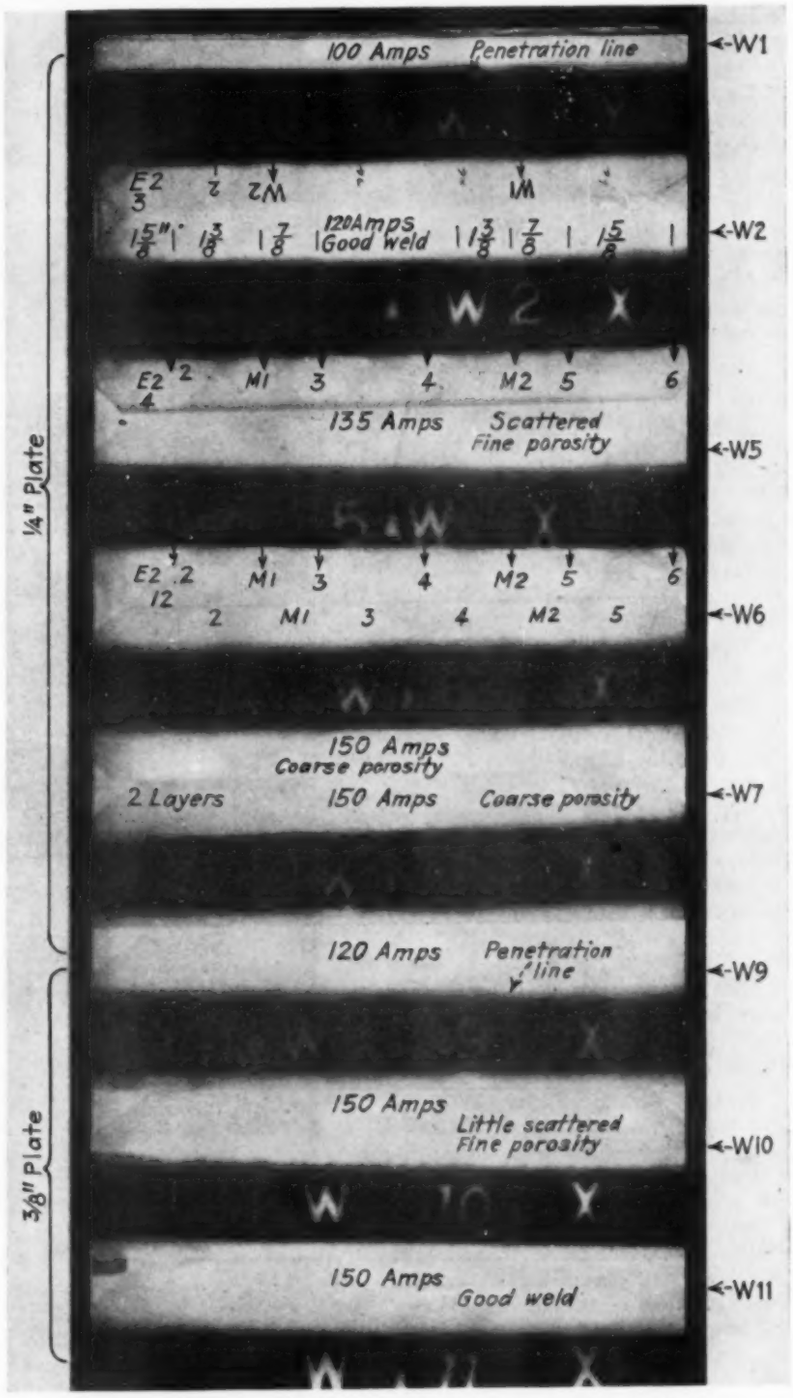
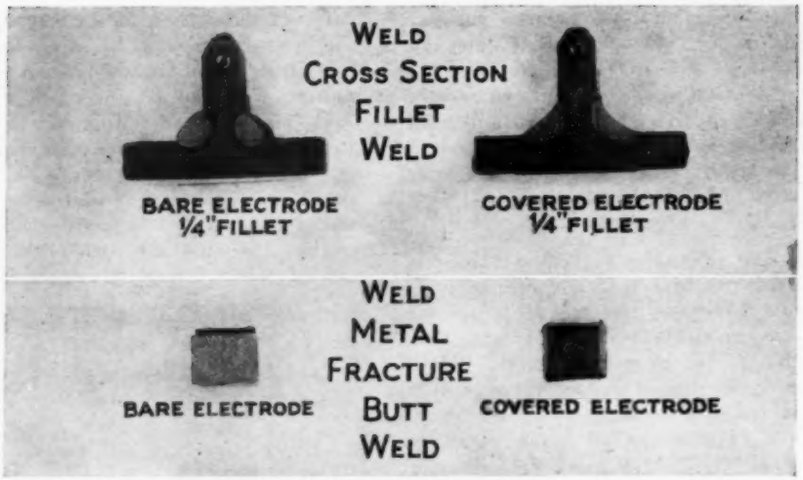


Fig. 5—Radiographs of the fillet welds, tested as in Fig. 4, afford a a convenient means of inspection



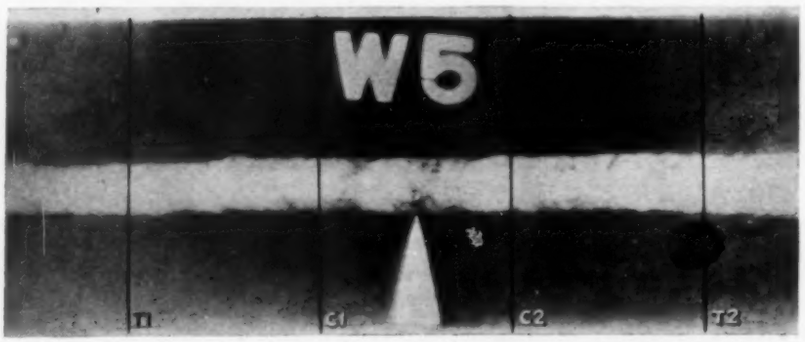


Fig. 6—Fractures of weld metals are compared for bare and covered electrodes. Fig. 7—Butt weld on ¼-in. nickel steel; electrode ¼-in. low carbon; 100 amps., 18-20 volts; single V, two layers; straight polarity, electrode negative. Fig. 8—Two additional radiographs of welds made under the same conditions as that shown in Fig. 7. Weld WC 12 used a seal bead, WC 13 a metal backing

continuity when made with bare electrodes. These differences in shearing strength of the fillet longitudinally do not appear when covered low carbon electrodes are used.

This question of stress distribution in welded joints and their effect offers a fertile field for study and experiment as little is definitely known about them. There are no recognized standard methods of study, and in most cases, methods used measure stresses in one plane and one direction only.

The physical differences between the weld metal deposited with bare and covered low carbon electrodes have been illustrated and discussed so extensively in the trade journals during the last few years that it is scarcely necessary to devote much space to this subject here. However, reference is made to Fig. 6, which shows the fractures of the two metals and the cross-sectional contours of fillet welds made with the two types of electrode on structural nickel steel plate.

The fillet made with the covered electrode shows a slightly concave surface, while the bare electrode fillet has a convex surface. The concavity is caused primarily by the thick slag deposited from the electrode and the fluid weld metal. The electrode used to make this specimen was of the "flat type," that is, suitable for flat welding only. With a commercial "position type" electrode, suitable for welding in any position, the fillet surface may have either a flat surface or a slight convexity quite similar to that of the bare electrode fillet.

In Figs. 7 and 8 are shown radiographs of butt welds on ¼-in. structural 3½ per cent nickel steel plate made with bare and covered low carbon electrodes. Fig. 8 (WC 13) shows effect of a metal backing when the weld metal penetrates through the joint without fusing to the backing material. Fig. 8 (WC 12) shows effect of using a seal bead to finish the weld on the under side of the joint instead of trying to penetrate entirely through from one side only.

The gas holes which are formed in the under side of the welded joint where the hot metal has contacted the backing strip can be easily detected in Fig. 8 (WC 13). This condition illustrates one reason for the use of seal beads in making butt welds where 100 per cent sound weld metal is desired with the covered electrode. Also the use of a seal bead on a butt joint produces a more uniform and dependable seal at the back of the joint than when the weld is made from only one side of the plate.

The welding procedure used in making a joint will depend to some extent on the composition of the material to be welded, and the effect of the heat of welding on it. A heat-affected zone

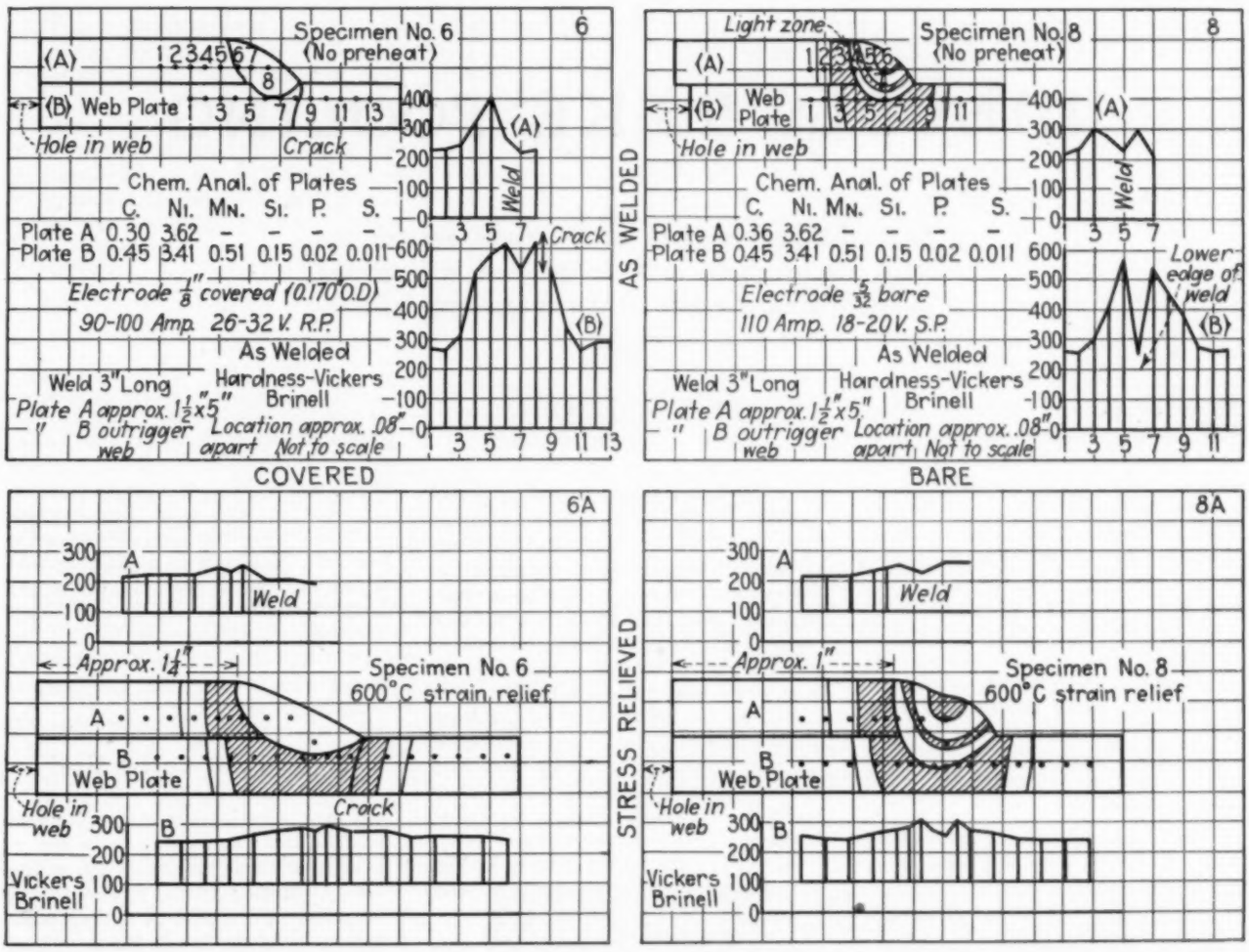


Fig. 9—Heat effect of single layer arc welds on 7/16-in. nickel plate for both covered and bare electrodes

must necessarily accompany any weld in which heat is used to make it. The metal structures involved will also depend upon the temperature gradient between weld metal and plate and the mass of the parts being welded. By means of a hardness test it is possible to determine the effect of the heat of welding without micro-examination of the weld itself.

In Fig. 9 is shown the heat effect of welding on 7/16-in. thick structural 3½ per cent nickel steel plate, containing 0.45 carbon and 0.30 per cent carbon where the weld is made in one layer. The effect of stress relieving at 600 C is shown by the curves in the lower half of the illustration.

It will be noted that with either type of electrode a reduction in carbon content of the plate of fifteen points results in a drop of 200 points or more maximum Vickers Brinell hardness in the heat-affected zones (compare maxima of *A* and *B* in upper half of the illustration). Stress relieving at 600 C reduces these maxima nearly to that of the plate metal unaffected by the heat of welding.

The weld condition shown here is representative of single layer fillet welds on this plate material and illustrates the importance of limiting the carbon content to avoid trouble from hardness and possible cracks adjacent to the weld. If the higher carbon plate is preheated as much as 150 to 200 C the maximum hardness would be reduced from 150 to 200 points. We have found it expedient to limit the carbon content of the structural nickel steel plate used for welding at Watertown Arsenal to a maximum of 0.35 per cent. All welded structures built of this material are given a 600 C stress-relieving treatment.

Stress Relief

With this heat-affected zone adjacent to the weld it has been found by actual test that stress relieving increases the impact strength of the joint from 50 to 100 per cent. This change is not found on mild structural carbon plate or other material where no appreciable hardness is encountered in the heat-affected zones.

On multiple layer welds, the successive heat applications of the various layers act partially to anneal the layer and heat-affected zone immediately preceding, so that the resulting hardness in the heat-affected zone is considerably less than in the single layer weld zone.

It may be in order to suggest that the welding industry, having progressed considerably in the use of mild carbon steel and the development of suitable welding materials therefor, is possibly turning its attention to the field of high tensile steels and their uses with a view to develop suitable methods of welding and materials for welding. One would imagine that the primary step would be the development of a steel having 100,000 lbs. tensile strength and so easily weldable that the parent metal could not be affected by the heat of welding. Such a material might be in great demand if it could be produced at a reasonable cost.

DIESELS TAKE TOOLING

Well designed cutters and fixtures answer the need for precision in a design that is knocking insistently on the door of the automotive industry

FRED H. COLVIN
Editor, American Machinist

THOSE who recall the early days of the internal combustion engine, and especially of the heavy oil types, cannot help being gratified at its growth in recent years. Gasoline engine development attracted so much attention that the diesel types received scant notice for several years. Now the trend toward heavy oil engines is unmistakable for certain uses, such as marine, tractor, portable power plant, truck and bus service. Among motors of this type which have gained adoption in these fields is that of the Hercules Motor Corporation. Some of the operations used in building this motor are illustrated.

In common with most motors of this type, Hercules uses wet sleeves, or liners, which form the cylinders and serve as the inner walls of the water jackets. This can be seen by examining the cylinder block in the foreground of Fig. 1. Final boring of the holes for the sleeve is done on a vertical machine. The block is supported on six hardened rest pads and located by two dowels that fit process holes in the usual way. The six bores are indexed by the notched bar on the front of the fixture. The fixture is mounted on rollers to be moved easily from bore to bore with the block in place. Incidentally, the block contains chromium to improve its wear resistance.

Details of the tool are shown in Fig. 2. The body of the reamer is of steel having two sets of inserted blades with negative helix angle. The front blades ream the block for the main fit of the sleeve while the upper blades counterbore for the head of the sleeve which seats in the counterbore. Between the two sets of blades is a plain surface which acts as a guide in the upper bored diameter. It will be noted that the tolerance of the main bore is but 0.0005 in. The counterbore diameter is not held as close, but the depth is quite important.

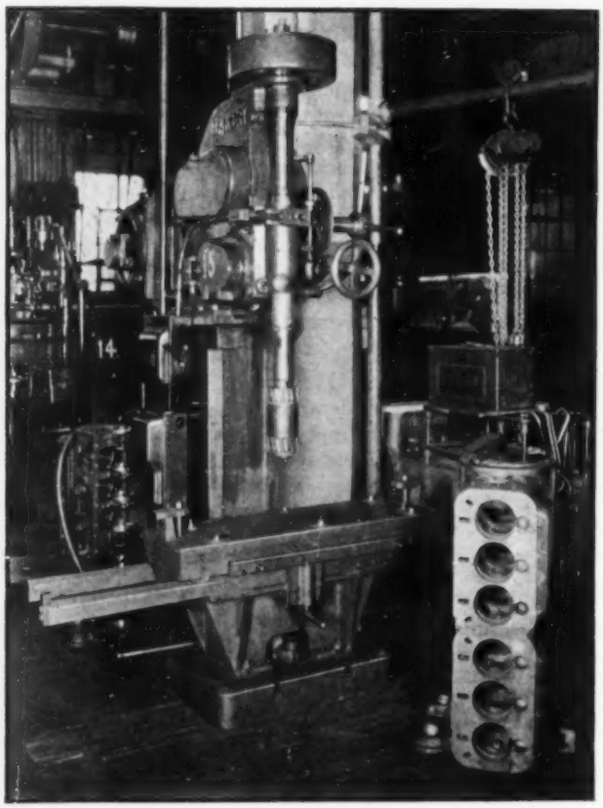


Fig. 1—A combination tool reams two diameters in each bore to receive the cylinder liner

Single Point Cutter Used

A special boring bar is used for final finish in the counterbore, as in Fig. 3. This is a single point, or fly, cutter with a carbide toolbit. The toolbit is carried in one arm of a three-point spider, while the whole bar is guided in the previously reamed surfaces in the block by three-point bearings at both ends. The three-point construction makes it easy to set the cutter by calipering to the diameter given, 4.531 in. In order to give a clear calipering surface opposite the cutter the adjusting screw *A* is offset to one side of the center line. The depth of the counterbore is determined by the collar *B* which seats against the upper surface of the block, while the bar turns inside it, against the ball-thrust collar *C*.

The lower end of the sleeve is sealed to prevent water jacket seepage into the crankcase. This is accomplished by two rubber gaskets that are held in V-grooves in the cylinder block at the bottom of the sleeve. These V-grooves are cut by the special bar in Fig. 4.

The two cutters *A* are held in a head at the end of boring bar. Behind these tools are beveled blocks *B* which bear against a wedge *C*. After the tool is placed in the cylinder bore with the ball-bearing end plate against the top of the cylinder block, pressure on the bar in the center compresses the

Fig. 2—Negative helix angle is employed for the two sets of inserted blades of this reamer used on chromium-bearing iron. Fig. 3—Three-point bearing at both ends maintains the tool in alignment for finishing the counterbore. Fig. 4—Wedge action feeds out two bits that cut V-grooves at the bottom of the bore for the sealing gaskets

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spring *D* and moves the wedge *C* past block *B* at the back ends of the tools, and forces the tools into the wall where the sealing rings go. The finished grooves are seen at *E*. With these sealing rings in place the sleeve is forced in and sealed by the rubber rings.

Final boring of the crankshaft main bearings in the cylinder block is done with single-point tools in bars that are supported in bearings at several points. One of these machines is seen in Fig. 5. All centers are measured from the camshaft hole, using the plugs shown at each end. These holes are bored one at a time, as this is believed to cause less distortion than where all holes are bored at the same time.

Connecting rods are gun drilled in the new self-contained machine shown in Fig. 7. The rods are held in three-point fixtures and a bushing is provided to guide the drill just before it enters the work. This machine has two spindles and completes two rods at one setting. The drill spindles have intermittent feed that withdraws the drills at given intervals to clear the flutes of chips and prevent breakage as well as crowding to one side. The operation is comparatively fast. It will be noted that these rods have integral cap bolts forged on the rod and machined by hollow milling tools. Details of the drilling fixture are seen in Fig. 6.

Babbitting the connecting rod bearings is not such a simple job as it seems, if it is done as it should be. The method developed in the Hercules motor plant is the result of both observation and experience extending over a long period. The main factor is

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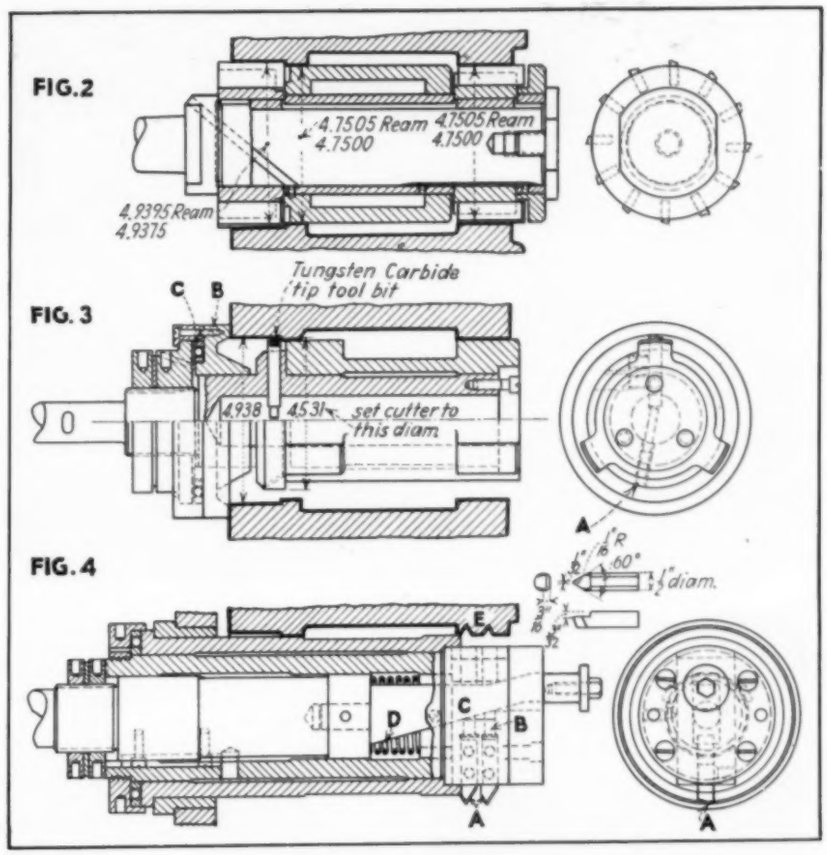
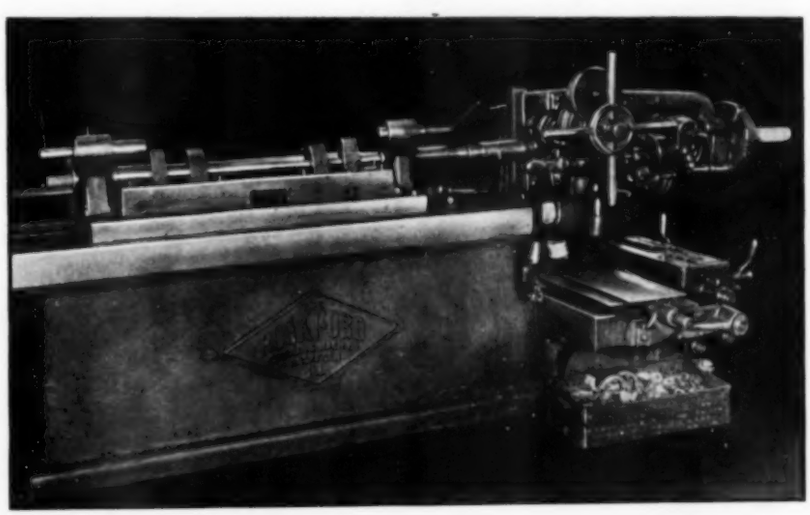
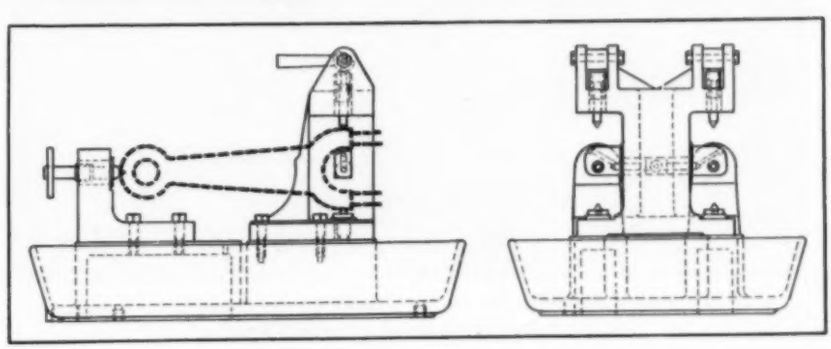
Fig. 5—Final boring of the crankshaft main bearings is done one at a time to prevent possible distortion. Fig. 6—Fast and accurate location of the rods is assured by this simple fixture







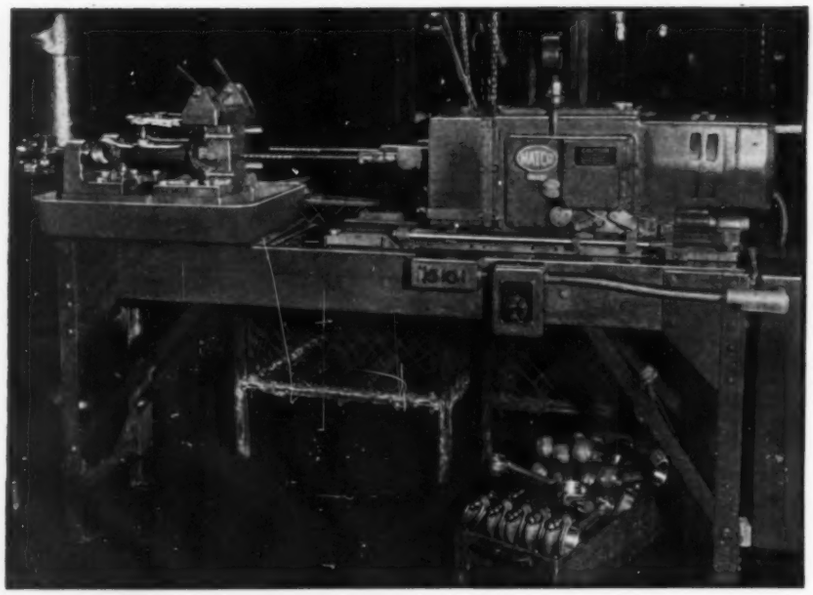


Fig. 7—Two connecting rods are gun drilled at once in a simple duplex fixture

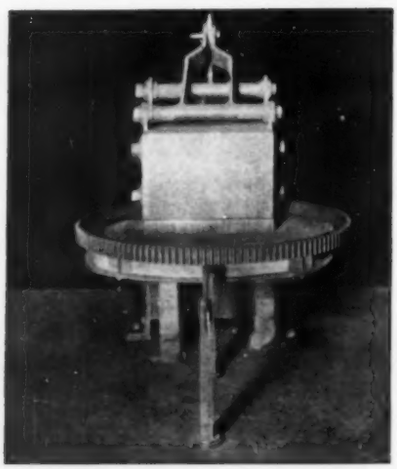


Fig. 8—Induction heating is a clean, quick way of preparing starter rings and other parts for shrink fits

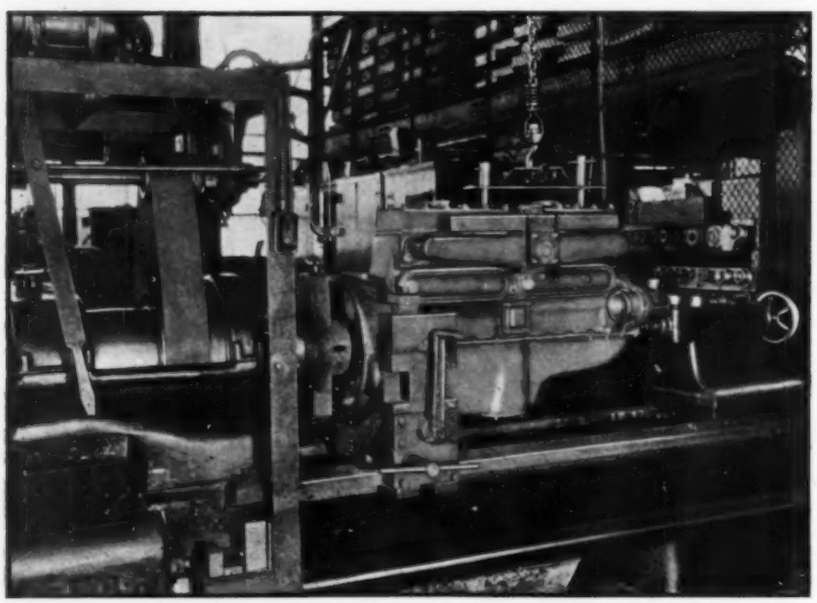


Fig. 9—After assembly the motor is held on the crankshaft centers while a facing tool finishes the bell housing

cleanliness, not only freedom from dust and shop particles but from finger prints as well. It is a strict rule that the surface to be babbitted must not be touched after it reaches this department.

The first step is to clean, or etch, the surface in a bath of hydrochloric acid. Then it is dipped directly into the flux and from here it goes to the bath of molten tin. On coming out of the tin the surface is gone over with a wire brush to remove any surplus tin and break up any small bubbles that may have formed. The rod is again dipped in acid and retinned before going to the spinning machines to receive the babbitt. This is poured while the rod is spinning in the usual manner. The result is a 100 per cent job with a babbitt lining that stays put and wears well.

Starter Rings Shrunk On

Starter rings and some other parts that are shrunk in place are heated in an inductive electric apparatus in Fig. 8. Several of these are used in different departments. The apparatus is practically an a.c. transformer in which the starter gear ring is equivalent to a single-coil secondary winding. The primary is made in two parts that opens to admit the work. It is then closed and the current turned on. The starter ring gear is heated sufficiently, and very uniformly, in a few seconds, and is ready to slip on the flywheel. Similar applications can be made in many places.

Squareness of the bell housing with the crankshaft is of vital importance if the engine and clutch are to work properly as a unit. Most shops pay careful attention to this point after the cylinder block and crankcase are assembled. Hercules practice goes a step farther. Here the final facing takes place after the motor is assembled. The centers of the crankshaft itself form the locating points for alignment. This is shown in Fig. 9, a special lathe being kept for this purpose.

The assembled motor is handled by a crane and supported on the fixture shown. The lathe centers enter the crankshaft centers and the sweep tool with the star feed faces and bores the end of the bell housing. After this is done, the motor is swung at right angles and both the bore and face tested with a sensitive indicator. The readings are recorded on a test card and filed so that any complaint of misalignment can be answered. This is particularly useful where clutches are applied after leaving the factory.

EDITORIALS

VOLUME 79 AMERICAN MACHINIST ESTABLISHED 1877 NUMBER 21
McGRAW-HILL PUBLISHING COMPANY, INC.

K. H. CONDIT • F. H. COLVIN
EDITORS

BUSINESS MUST STUDY TAXES

MR. ROOSEVELT tells us that he sees no need for "new taxes or increased rates on existing taxes to meet the expense of annual operations and to retire the public debt." But he leaves himself a loophole in case the Supreme Court decides that somebody other than business men has to pay farm benefits, or in case Congress passes the bonus over his veto.

Evidently the rising tide of recovery is supposed to fatten business income enough to pay off some thirty billions of federal debt. But what a tide that will have to be! The tides of 'Quoddy, which are to supply New England with power for generations to come, and incidentally to wash all the Republicans into the Atlantic Ocean, are but ripples in comparison.

The President is rather too casual about taxes, and in his dismissal of those who worry about them. Our whole tax structure is in need of a thorough overhauling—federal, state, municipal.

New Jersey is vigorously objecting to a sales tax that is driving business out of the state and bears hardest on the poor. New York's financial head says that thirty cents of every tax dollar in his state comes from motorists. The latest tax effort of the Federal Congress was anything but fair and reasonable.

What are we going to do about it? And who is going to do it?

Heretofore we've left it pretty much up to the politicians and legislators. That was their job. The job of business men and manufacturers was to make money to pay the taxes.

But the problem is too big now for any politician to handle, even if he is absolutely on the level and wants only to do what is best for the whole community. Too many different breeds of taxers are reaching for the same tax dollar. And there are too few varieties of taxes to go around. When you have listed sales taxes, income taxes and real estate taxes you have exhausted the really fruitful sources. A tax on capital is obviously anything but fruitful.

Furthermore, a politician has to get himself reelected. And that makes it hard for him to handle tax legislation fairly.

Business, using the term broadly, is the only group in the community that can really do the job right. Business men hold their jobs because of their ability rather than their popularity, and thus they are free from the politician's greatest handicap on such work.

Now that confidence has returned and recovery is at hand, the big task ahead is to find out how to pay the bills. Business can do it. It should do it for the common good. It must do it for its own protection. When a way has been found politics will accept it.

Special Maintenance

ELECTRICAL and hydraulic mechanisms are being employed in machine tools to such an extent that maintenance has become a real problem. Not because of inherent weaknesses in either system but in the natural wear and tear that accompanies any form of mechanism.

In plants large enough to warrant a thoroughly trained corps of electricians and experts in hydraulic mechanisms, maintenance can well be the department to handle all sorts of trouble or maladjustments as they occur. But the repair man in the small shop can hardly be expected to be expert in all the various control mechanisms that are now in use. And unless he is, production is bound to suffer by machines being "down" longer than necessary.

Some plant managers are encouraging the idea of highly specialized maintenance service to take care of all adjustments and renewals in an industrial center or district. A few highly skilled men could service a large number of machines over quite an extensive area. They could give regular inspections which would forestall many failures and shutdowns, or they might come on call when needed. Such men could build up a good business and make their services indispensable to moderate sized plants.

Chips

Washington—Roosevelt holds a cabinet meeting before he starts off on speaking trip, hears Miss Perkins tell of 180,000 increase in employment in August, tells private relief agencies big job is ahead of them, remarks that permanent group of unemployed is sure because of technological advances . . . Richberg, now in private practice, admits predicted chaos following upset of NRA has totally failed to materialize . . . Federal Reserve Advisory Board reports best business outlook since 1929 . . . Hull's committee on contraband munitions makes up list and Roosevelt announces it, includes warships, airplanes, all kinds of guns and ammunition and poison gases . . . President says he is willing to let business handle the chiselers if it can, tells it to finish reemployment job . . . Appoints George L. Berry recovery coordinator and authorizes Federal Trade Commission to approve voluntary trade agreements . . . Tells country no new taxes will be needed, a statement also made to Congress some months before soak-the-rich tax was ordered . . . Announces U. S. neutrality and prepares to issue munition embargo list.

Foreign—Mussolini calls united Italy to arms to take Ethiopia, fight war with war if Europe tries to stop him . . . Ethiopians mobilize on frontiers, British fleet masses in Greek waters . . . League moves to invoke sanctions against Italy . . . Small powers ship arms to Ethiopia . . . Germany ready to take care of new draft of 200,000 and train them for fighting at ten army posts and six air bases . . . Jewish organizations offer plan to Reich Interior Department for migration to Ecuador . . . Russians rejoice as food cards are abolished.

Finance—FHA does record weekly business of over fourteen millions in modernization financing . . . Landis succeeds Kennedy as chairman of SEC, promises continuation of present policy . . . Republic merger with Corrigan-McKinney is completed and appointments announced . . . Utilities unite to test constitutionality of legislation affecting them . . . Treasury offers to redeem at face value eight billions of bonds and notes now selling above par . . . Estimates a fiscal deficit $1,250,000,000 below the estimate of last January . . . Van Sweringens regain control of their railroads as friends buy collateral of Alleghany Corporation at auction . . . Great Britain will not return to gold standard now . . . Stocks break sharply on war news, wheat and cotton jump as sharply, then recover as hysteria subsides . . . New taxes ruin railroad refunding plans.

Industry—Unions beat Hopkins in WPA wage scale controversy, will work 80 hours for $93.30 instead of 120 . . . Soft coal strike is settled after six days of negotiations, both sides yielding ground, operators increasing wages, miners failing to get 6-hour day . . . New Deal jobs to be put under Civil Service (some time) . . . Colt's votes seventh quarterly salary and wage bonus of 5 per cent . . . Tobacco industry gets first of the new "voluntary" codes . . . Gulf ports fight stevedore strikes . . . Craft unionists prepare for convention fight on vertical or industrial union advocates . . . Bureau of Labor statistics issues report condemning company unions.

Trade—British and French groups at Geneva ask for stabilization and release of trade . . . U. S. export balance drops to lowest point in years . . . Merchant ships being re-routed to avoid Suez Canal and Egyptian and Italian ports . . . France substitutes higher duties for import quotas on certain machine tools.

Indicators—Steel production resumes upward trend . . . Electric power output off slightly but up 12½ per cent over last year . . . *Business Week's* index drops off 2 points to 64.9.

A. A. Ross Announces A.G.M.A. Program

Besides gear problems, such diverse topics as industrial relations, cost accounting and trade-association objectives appear on the program for the semi-annual meeting of the American Gear Manufacturers Association. The meeting is scheduled for October 14-15 and will be held at the General Brock Hotel, Niagara Falls, Canada. A. A. Ross, president of the association, announced the program as follows:

Practical Treatment of Industrial Relations Problems, by Louis Ruthenburg, of Servel, Inc.

Trade Association Objectives, Policies and Activities, by W. J. Donald, managing director of N.E.M.A.

Gear Lubrication, by T. C. Dick of the Texas Company.

Metallurgical Analysis of Gear Failures as Seen Through the Microscope, by John T. Howat, chief metallurgist, Pittsburgh Steel Foundry Corp.

Gear Tooth Wear or the Strength of Gears from the Transmission Standpoint, by J. O. Almen, head of research division, General Motors Corp.

Educating Shop and Office Employees in Their Duties, by H. H. Kerr, president of Boston Gear Works, Inc.

Speed Increasing Gears and Gear Units and Their Technical Differences from Reducing Gears and Gear Units, by P. C. Day, Falk Corp.

An Analysis of Our Cost Accounting Manual, by H. N. Mathias, Auditor, Westinghouse Electric & Mfg. Co.

Refrigerating Group Sets Up Standards

A broad equipment standardization program will be recommended to the Refrigerating Machinery Association at the annual meeting, October 11, Palmer House, Chicago. D. Norris Benedict, president of the association, said that the program has been under development for several months. It is proposed that the equipment made by the members be divided into seven groups, standardization for each being in the hands of a standards sub-committee.

France Drops Quotas, Raises Import Duties

The French import quota restrictions on certain machine tools (tariff items 525 A, 525 H and 525 I) were abolished and the import duties on these items were substantially increased instead, with revised classifications, by a decree effective October 1, according to H. C. MacLean, commercial attache, Paris, in a report to the Department of Commerce.

French import quotas for the fourth quarter of 1935 for certain other industrial products hitherto subject to import quota restriction were also published without important changes.

Cumulative effects of restrictive quota measures and a domestic industrial decline are reflected in the imports of machinery by France. In the first half of 1935 the value of such purchases was 652,319,000 francs (value of franc 6.6 cents) as against 823,354,000 francs in 1934 and 1,907,247,000 francs in 1929 for the corresponding periods. In spite of almost complete control of the domestic market, French manufacturers report very unsatisfactory business in the current year.

Foundry Equipment Orders Rise Again

Net orders of the Foundry Equipment Manufacturers Association increased 21 per cent in August over the preceding month. The index rose to 113.0 from 93.3. Unfilled orders rose to 142.3 from 126.5. Shipments lagged, the index dropping to 97.2 as compared with 102.3 in July. Twenty-two firms contributed to the report.

Connecticut Yankees' Industry on Show

More than 100,000 articles, the products of 1,000 of the state's manufacturers, have been on exhibition since Oct. 2 during the Connecticut Tercentenary Exposition at the State Armory in Hartford. This exposition, which dramatizes the industrial progress of the state in the last 300 years, will close on Saturday, Oct. 12. Doors are open from 10 A.M. to 10:30 P.M.

Navy Awards Contracts for Six Submarines

Contracts for building six submarines were let on Sept. 28 by the Navy Department. Two will be built by the Portsmouth, Me., Navy Yard, one at the Mare Island, Cal., Navy Yard and three at the Electric Boat Co., Groton, Conn. The Winton Engine Corp., Cleveland, and the Hooven-Owens-Renschler Co., Hamilton, Ohio, will each furnish three sets of propelling machinery. The Elliot Co., Pittsburgh, won the contract for all six sets of electrical equipment. Winton got $2,288,145, Hooven-Owens-Renschler $2,447,232 and the Elliot Co. over $1,000,000.

William A. Irwin Speaks At A.S.M. Annual Dinner

An address on October 3 by William A. Irwin, president, United States Steel Corporation, at the anual banquet was the high spot of the seventeenth meeting of the American Society for Metals held at the Palmer House, Chicago. Mr. Irwin expressed optimism in the future of the steel industry and estimated an output of over 32 million gross tons for the current year. "Statistically we are led to believe," he said, "that if the average ingot production of 41½ million gross tons a year for the ten-year period ending with 1929 indicates the position of steel production with respect to the demands of trade there should soon be considerable room for increased production over that of our present rate, in view of the low average applying in the last five years.

"In the adoption of improved mechanical equipment," he continued, "the mention of a few examples will indicate the trend of developments. Hot strips mills, along with cold reduction mills, probably stand at the head of the list. Die rolling, electric welding, improved seamless tube mills, the furnaces for heating steels in controlled atmospheres, are performing new services in their respective fields."

In conclusion Mr. Irwin stated that "We are far from conceding that the end of the Age of Steel is in sight" and named, as new applications, streamlined trains, similar developments in street cars, trucks and buses, special steel for aviation, superstructures of ships, office interiors and houses and beverage containers.

Because of the illness of Benjamin F. Shepherd, Ingersoll Rand Co., president of the society, R. S. Archer, Republic Steel Co., acted as toastmaster. The Albert Sauveur Achievement medal was awarded to Zay Jeffries, consultant for the U. S. Steel Corporation, in recognition of his notable work in grain size, hardening and many other metallurgical accomplishments.

William H. Phillips, vice-president, Molybdenum Corporation of America, received the Past President's medal. A certificate was given to H. W. McQuaid, Republic Steel Co., for his delivery of the Edward De Mille Campbell Memorial lecture.

The Henry Marion Howe medal for the outstanding paper published in the A.S.M. *Transactions* during 1934 went to the joint authors, T. D. Yensen, Westinghouse Electric & Manufacturing Co., and N. A. Ziegler, West Penn Electric Co.

Rumors Keep Washington Busy as Roosevelt Fishes

WASHINGTON—With the President out of Washington bureaucrats and local observers are free to resume that most fascinating of Washington pastimes—manufacturing and spreading rumors. The wiseacres say that there will be no new tax legislation before the election. They also say that the ways are greased for the Soldiers' Bonus and that it will go through promptly when Congress reassembles. It is also generally believed that the Supreme Court will knock out the processing taxes and that new money will have to be found to pay them as well as the bonus. Everybody noted that the President, when he talked about taxes, left himself an out on these two sore spots.

War in Europe, if it should follow Mussolini's venture in North Africa, would mean a business boom in the United States. Washington economists point out that there will be wide fluctuations in speculative markets if war starts but that the necessity of stocking up will force strong activity. The metal-working industry will be one of the first to be hit by such demands which will aggravate the present difficult situation caused by shortage of skilled men.

Government tax experts are making an intensive study of special levies calculated to take the profits out of war enterprises. Everyone hopes the President will be able to keep us out of a general fracas but the more thoughtful ones remember similar ideals twenty years ago and what happened then.

Consideration is being given the gathering of really comprehensive figures on the national income and on the capital market. Current data on these subjects are now woefully inadequate. Another crying need is for figures covering stocks of important commodities. The depression revealed that stocks of many articles were much greater than had been supposed.

While officials are refraining from making public statements about it, they believe that a much larger reduction in unemployment has taken place than is being generally assumed. In the absence of any comprehensive figures on unemployment they have nothing tangible to support their impression but the increased amount of activity in lines of work which make no statistical returns lead many to think that employment is more general than sample statistics indicate.

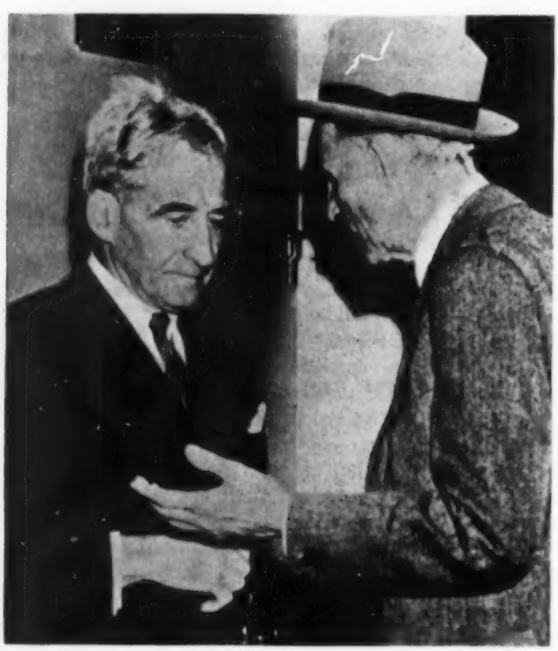
Nearly every day some additional straw points toward the proposed constitutional amendment as the big issue in the coming presidential campaign. No opportunity is being lost to try to make unpopular the provisions of the Constitution which stand in the way of federal control of production. Much will be heard at the next session of Congress of transferring the authority to incorporate from the states, not in a position to control the concern they create, to the federal government that could exercise control through conditions written into charters.

Prospect held out by the President that NRA may not be revived will prompt those who want it to talk all the louder. Many business men are genuinely in favor of a new law and labor will not be satisfied with the President's statement that if industry can maintain fair trade practices and labor conditions there's no need of codes. His apparent apologia for ever doubting that business could live up to NRA standards without compulsion is tempered by knowledge that there will always be enough evidence of chiseling to justify any move that he decides to make. NRA's old staff is trailing the results of code abandonment and even though an industry may not agree with its findings, they should not be discounted as President will be disposed to accept them at face value.

Major George L. Berry has been given the job of coordinator for industrial cooperation. He thinks that a lot of good can be done by the skeletonized NRA which is still functioning feebly. Known principally for his skillful direction of the affairs of the Pressmen's Union he is also a large employer, chairman of the board of one bank and director of another. He is the largest farmer in southeastern United States. He has a tough problem on his hands but is well qualified to solve it.

Investigation of patent pools and cross-licensing agreements by the House Patents Committee will start October 14 with a hearing on the American Telephone & Telegraph patent structure.

Inquiry into the aviation and oil industries will follow, according to Chairman Sirovich, sponsor of the bill, to require registration of all patent pooling agreements with the Patent Office in order that the Federal Trade Commission may pick up any scent of monopoly.



Making a Point—Henry Ford and Gerard Swope get into a quiet corner at Schenectady. Mr. Ford inspected a G.E. turbine and some electric furnaces going to River Rouge as part of the progressive improvement program there. He was also treated to one of the G.E. "magic" stunts when he called Buenos Aires and Detroit from a telephone on the dash of a V-8

C. W. Blakeslee Heads Chicago Machinery Club

In an article concerning the reorganized Machinery Club of Chicago (*AM*—Vol. 79, page 732n) it was incorrectly stated that H. H. Brettman is president of the club. As a matter of fact, the president is C. W. Blakeslee, who is sales manager of N. A. Strand & Co. Mr. Brettman is secretary and treasurer of the club and has no connection with N. A. Strand & Co., as originally stated.

Ambitious Plans for 1936 Output Show Optimism in Auto Industry

DETROIT—With the passing of September the automobile industry is swinging into the production of new model cars. All models are not in production due to frequent last minute changes, but all makers are working on some models. Production has been reasonably steady for the first eight months of the year and the wage earners have had steady employment. This means an accumulation of potential purchasing power.

Introductions the first of next month are expected to engender a peak in fall buying. Changes are in the nature of refinements in mechanical performance and a smoothing of lines that will attract. Buick and Packard, announced the last week in September, are probably indicative of the trend. The influence of the Olds styling is evident.

1936 Schedules

With a production to the first of September greater than that of any full year since 1929, the industry is planning for greater things ahead. Packard plans 79,000 for 1936, the highest in the company history. Pontiac, with 48,000 planned for the rest of this calendar year, expects 225,000 by September 1936. Buick is shooting at 135,000 of the '36 series. Other makers are displaying the same optimism.

Some commentators point out that in 1934 more automobiles were sold than should have been in view of past relation of sales to national income. While plans just mentioned are, of course, hopeful guesses, nevertheless the millions spent in improving and extending facilities, in the tooling for new models and in the purchase of materials, generates a spiral in which national income is increased and in turn supports greater buying.

Usual production difficulties in the nature of machine breakdowns are being encountered with the new setups. One harrassed executive advocated extensive use of clutches and shear pins in the design of machine tools to get around this difficulty.

Activity in machinery is on a sustained basis. It is reported that considerable buying of standard machines by tool shops in this area followed the Cleveland show. That the automobile industry is replacing old standard equipment is shown by the plan for an expenditure of $200,000 by one producer for this type of equipment. This development of standard-machine business has no connection with the production of new models and is stated to be general in the industry. A rumored stamping plant to be built in Detroit involving an expenditure of $9,000,000 will help sheet metal and conveying machinery sales.

Price reductions by Buick ranging from $40 to $385 have led to speculation as to price lists of other makers. While steel prices, and that of most materials, are not changed, fabric and trim prices are increasing.

With substantial profits made during the last few quarters, the industry is faced with a problem in economic statesmanship. To increase hourly rates, already at '29 levels, will so increase costs that car prices will be raised to a point where disparity with other products produced at lower wage rates will seriously curtail sales.

With hourly rates of tool and die makers above those of 1929 and a scarcity of skilled men listed in the area, no labor trouble has resulted. The A. F. of L. interests were combined with the International Automobile Workers Union the last of August. Meanwhile the Federation of Metal and Allied Unions, an eastern organization, is attempting to draw within its folds the M.E.S.A., the former Hudson affiliate of the A. F. of L. and other groups. Relatively steady employment at increasing wages over the past several months is, however, a bar to labor organizations and an insurance against labor troubles.

It was just a year ago that the Automobile Labor Board began its plant elections for proportional-representation works councils. The future of these organizations is in doubt although management generally is desirous of continuing them as methods of dealing with their employees. It is considered that their worth and value have been clearly demonstrated. The Wagner Board for this area has not yet formed a policy concerning this set up and there is no outside agency to hold elections.

Industrial Review

• Although a few distributors and builders of machine tools express a little disappointment that the Cleveland Show did not result in an immediate stimulation of orders, most of them are very well pleased with the results. Even the disappointed ones have been cheered up by the improvement visible during the first week of October, and everyone is looking forward to active business during the rest of the year.

• New England reports a flood of inquiries following the show and a bright outlook for business. Many companies are complaining of the shortage of skilled men. The metropolitan district found September better than August. Philadelphia, conservative as ever, has been slow to get excited over the new machines exhibited at Cleveland. There is no apparent shortage of good men in Philadelphia or around New York. In Pittsburgh shop men have made up their minds what they want to buy and are asking for prices. There is a real shortage of good men here.

• Sentiment is more cheerful in Cleveland, the labor situation being quiet and a bad local administration having been voted down in the primaries. Employment is up and several companies have more orders than they can comfortably handle. Detroit is going strong although the World Series has diverted attention from routine business. The automobile builders are optimistic but they are preparing for increased business by modernizing their production equipment rather than by expansion. Business in Toledo is still selective but is broadening. Lack of skilled men is a source of worry.

• Cincinnati is beginning to notice the effect of the Machine Tool Show as buying breaks through. Skilled workers are scarce. Demand is also opening up in St. Louis and some orders are being placed. Supplies have kept up very well. As one distributor puts it, Chicago dealers have a mountain of stuff to work on. September was a good month and fall prospects are excellent. Milwaukee has had one bad strike but business continues to improve despite political interference, local and national. The West Coast reports much interest stimulated by the new models shown at Cleveland. The outlook is far better than it was a year ago.

Lower Interest Rates May Aid German Machinery Replacement

BERLIN—The outstanding feature of German industrial recovery during the last few months has been the shift from public works to orders placed directly or indirectly in connection with rearmament. Needless to say, the machinery industry is now best employed in branches most concerned with the work of creating one of the most modern and powerful technical instruments an army has ever possessed.

The general position of the machinery industry can be characterized by the following two figures, the latest available. The production index for the machinery industry in May was 91.1 as compared with 69.4 a year ago (1928 = 100). Furthermore, according to a special investigation recently completed, the industry was working at 77 per cent of its normal capacity during the first half of 1935. Certain branches are still only employed at somewhere near 20 per cent of capacity, but it is obvious that other branches have practically reached the maximum of their technical and economic capacity. This applies particularly to the machine tool industry.

Obsolescence of industrial equipment generally is expected to lead to an increase in private orders. Best opinion is that the normal yearly replacement of machinery has not taken place since 1930. In 1931 and 1932 only a fraction of the obsolete equipment was replaced, and 1933 and 1934 were deficient in this respect. According to estimates, the value of orders necessary to replace obsolete machinery approximated 2,500,000,000 marks at the beginning of 1934.

The gradual, though partly artificial, lowering of interest rates, it is believed, will constitute a powerful factor in prompting replacement of obsolete equipment. Cheaper credit to farmers has been instrumental in raising annual sales of agricultural machinery in Germany from 90 million marks in 1931-32 to 230 million marks in 1934-35.

There are factors, however, that hinder the replacement of obsolete machinery. One of these is the cheap price of used machinery. Another is the depletion of liquid assets of industry by such actions as the export subsidy plan initiated by Dr. Schacht. At the time it was stated that the importance of export trade to Germany called for heavy sacrifices on the part of industry at the expense not only of profits but of amortization funds if necessary.

Absence of substantial recovery in machinery exports is particularly felt in Germany, where the "export quota" in certain branches of the machinery industry normally exceeded 50 per cent. No wonder, therefore, that partial successes in reviving German machinery exports are noted with particular satisfaction. This applies, for instance, to the news that the Friedrich Krupp A. G. in Essen was successful in securing against strong foreign competition an order for 29 locomotives for India.

In view of the rôle that Soviet orders played in the German machinery industry three or four years ago, the absence of new orders is particularly resented. In 1932 machinery exports to Soviet Russia constituted 40 per cent of the total machinery exports. In 1934 this had fallen to 6 per cent.

Antipathy to Soviets

The resentment of German industry is particularly acute on the ground that the Soviet-German agreement of April, 1935 offered the Soviet government credit facilities such as it has not yet obtained from any other country (5-year credit and interest 2 per cent above the official bank rate). Under this agreement the Soviet government undertook to place orders, mainly for industrial equipment, in the amount of 200 million marks during the current calendar year. These orders were to be "additional"; that is, in excess of current business approximating 60 million marks per annum.

Although more than five months have now elapsed since the conclusion of this agreement, the amount of new orders placed is insignificant, and even the "regular" orders are far behind the monthly average of five million marks on which the April agreement was based. Soviet import organizations assert that they have not been able to place larger orders with German machinery makers because of the high prices quoted. Now the Germans think the agreement was made to force better terms elsewhere.

Exports of Machinery During August, 1935

	August 1935	July 1935	August 1934
Electrical machinery and apparatus	$6,548,059	$6,241,906	$5,971,444
Power generating machinery (except automotive and electric)	654,128	683,136	591,258
Construction and conveying machinery	737,396	1,106,375	500,490
Mining, well and pumping machinery	2,410,654	2,335,368	2,278,572
Power-driven, metal-working machinery	2,053,853	2,105,069	1,546,157
Other metal-working machinery	192,417	153,524	147,806
Textile machinery	646,524	1,422,769	615,789

Exports of Metal-Working Machinery During August 1935

	August 1935	July 1935	August 1934
Engine lathes	$77,816	$105,986	$19,794
Turret lathes	29,653	49,428	32,121
Other lathes	93,167	99,700	97,063
Vertical boring mills and chucking machines	133,534	115,966	48,638
Thread cutting and automatic screw machines	59,423	90,393	117,639
Knee and column type milling machines	52,778	72,827	52,962
Other milling machines	193,649	175,184	73,934
Gear cutting machines	77,424	181,564	90,382
Vertical drilling machines	25,044	41,877	4,597
Radial drilling machines	24,887	17,175	7,355
Other drilling machines	47,815	62,445	46,641
Planers and shapers	51,128	67,464	12,798
Surface grinding machines	52,432	31,671	34,030
External cylindrical grinding machines	47,631	49,703	76,064
Internal grinding machines	84,489	51,530	60,956
Tool grinding, cutter grinding and universal grinding machines	59,027	72,964	41,115
Other metal grinding machines	28,588	43,515	26,414
Sheet and plate metal working machines	202,127	129,762	237,577
Forging machinery	135,821	114,316	101,562
Rolling mill machinery	317,578	284,380	95,119
Foundry and molding equipment	61,663	25,166	84,515
Other power driven metal-working machinery and parts	198,239	222,053	184,881

Other Metal-Working Machinery

Pneumatic portable tools	66,220	51,300	34,642
Other portable and hand or foot operated metal working machines and parts	59,792	49,013	45,881
Chucks for machine tools	10,595	18,191	8,608
Machine operated pipe and thread cutters, stocks, dies, taps, and other machine-operated cutting tools	27,615	25,137	40,209
Other metal working machine tools	28,195	9,883	18,466

Joins Whitman & Barnes

J. S. OGSBURY

PERSONALS

JAMES S. OGSBURY, for many years associated with subsidiaries of International Business Machines, Inc., in various executive capacities, has been elected vice-president and comptroller of Whitman & Barnes, Inc., Detroit. Previous to going with Whitman & Barnes, he was general manager of the Dayton Scale Division of International Business Machines, Inc.

KENNETH ANDERSON has been chosen administrative assistant to ERNEST G. DRAPER, who was recently appointed Assistant Secretary of Commerce by PRESIDENT ROOSEVELT. Mr. Anderson was associated with the American Management Association from 1930-1933. He is a graduate of Dartmouth College and has been assistant secretary of the Rubber Mfgs. Assn.

DAVID P. CAREY, superintendent of the New York, New Haven & Hartford railroad shop at Readville, Mass., has been appointed assistant general mechanical superintendent.

J. P. DILLON, JR., president, Struthers-Wells-Titusville Corp., Titusville, Pa., has been elected president of the Steel Heating Boiler Institute. HOMER ADDAMS, president, Fitzgibbons Boiler Co., Ogdensburg, N. Y., and W. R. MEIKLE were elected vice-presidents, and R. A. LOCKE, Middletown, Pa., secretary.

C. ALLEN GODDARD has been elected president and treasurer of Ball & Socket Manufacturing Co., Cheshire, Conn. Mr. Goddard succeeds the late FREDERICK A. IVES. Other officers elected are CHARLES J. FARIST, secretary, and THERON S. FRENCH, assistant treasurer.

DR. R. J. G. MCKNIGHT has been elected president of the Keystone Driller Co., Pittsburgh. Dr. McKnight succeeds LESLIE M. JOHNSTON, who has resigned.

OBITUARIES

FREDERICK E. DELANO, cousin of President FRANKLIN D. ROOSEVELT, died Oct. 3. Mr. Delano was 73 years old. He had retired as superintendent of General Electric Co., Erie, Pa.

OSCAR JUNGGREN, until recently design engineer, turbine department, General Electric Co., died Sept. 24. Mr. Junggren was born in Landskrono, Sweden. After graduating from the engineering college at Malmo he came to America and was first employed by Edison Electric Co., N. Y., in 1889. In 1891 he became associated with General Electric Co.

He was a prolific inventor, with some 130 patents to his name. As chief designing engineer, he collaborated with W. H. R. EMMET, chief engineer, in the design and construction of the first large Curtis turbine which is displayed today in the G-E Schenectady Works as a "Monument to Courage."

MRS. MYRTLE STEVENS BENNETT, founder and president, Wilson & Bennett Manufacturing Co., Chicago, died Sept. 22. Mrs. Bennett was 71. She founded the company in 1909.

BUSINESS ITEMS

The Bantam Ball Bearing Co., South Bend, Ind., and The Torrington Co., Torrington, Conn., have made arrangements for an exchange of stock. The former will continue operations at South Bend as a subsidiary of The Torrington Company. There will be no changes in personnel. K. L. HERRMANN continues as general manager of the Bantam Company.

The Bellevue Mfg. Co., Bellevue, Ohio, and the Motor Valve Products Corp., Ravenna, Ohio, have been consolidated. Machinery and equipment of the Ravenna concern has been removed to Bellevue.

Inventions Digest, Inc., 310 South Michigan Ave., Chicago, Ill., which has been furnishing manufacturers with information concerning American inventions, is rounding out its service by adding patent listings of several European countries.

Mack Tool Co., Inc., Commercial St., East Rochester, N. Y., will be sold at public auction, November 1.

Now a Vice President

F. B. HEITKAMP

Lyon Metal Products, Inc., Aurora, Ill., has elected FREDERICK B. HEITKAMP vice-president in charge of sales. Mr. Heitkamp has been general sales manager of the company since 1934. Prior to that he held the same position with Cincinnati Milling Machine and Cincinnati Grinders, Inc.

American Hammered Piston Ring Co., Baltimore, Md., and the Skinner Chuck Co., New Britain, Conn., have announced that they will cooperate in the manufacture and sale of piston rings.

Timken Roller Bearing Co., Canton, Ohio, has appointed JULES A. MORLAND as technical representative in South America, with headquarters at City Hotel, Buenos Aires, Argentina.

MEETINGS

AMERICAN GAS ASSOCIATION. Seventeenth annual convention. Oct. 14-17. Chicago, Ill., ALEXANDER FORWARD, managing director, 420 Lexington Ave., New York, N. Y.

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Eighteenth semi-annual meeting. Oct. 14-15. The General Brock Hotel, Niagara Falls, Canada. J. C. MCQUISTON, secretary, Penn-Lincoln Hotel, Wilkensburg, Pa.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Aeronautic meeting. Oct. 10-12. Hotel Chase, St. Louis, Mo. E. H. SAGER, secretary, Washington University, St. Louis, Mo.

CONNECTICUT TERCENTENARY INDUSTRIAL EXPOSITION. Oct. 2-12. State Armory, Hartford, Conn. JOHN H. GOSS, Scovill Mfg. Co., Waterbury, Conn., chairman.

AMERICAN MANAGEMENT ASSOCIATION. Annual marketing meeting. Oct. 23-24. Hotel Waldorf-Astoria, New York, N. Y. Personnel Division. Jan. 1936. Chicago, Ill. Alvin E. Dodd, executive vice-president, 20 Vesey St., New York.

INDUSTRIAL MATERIALS EXHIBIT. Third annual exhibition. Oct. 21-25. Hotel Astor, New York, N. Y.

INDUSTRIAL PRODUCTS EXHIBIT. Second exhibit. Oct. 22-23. Schroeder Hotel, Milwaukee, Wis. J. L. HARTMAN, The Oilgear Co., secretary exhibits committee.

INTERNATIONAL ACETYLENE ASSOCIATION. Thirty-sixth annual convention. Nov. 12-15. Cleveland Hotel, Cleveland, Ohio. H. F. REINHARD, secretary, 30 East 42d St., New York, N. Y.

SAFETY CONGRESS. Twenty-fourth annual congress and exposition. Oct. 14-18. Kentucky, Brown and Seelbacher Hotels, Louisville, Ky. National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

SOCIETY OF AUTOMOTIVE ENGINEERS. Tractor and industrial power meeting. Oct. 11-12. Palmer House, Chicago, Ill. Annual meeting, Nov. 4. Hotel Commodore, New York, N. Y. J. A. WARNER, secretary, 29 W. 39 St., New York.

PATENTS

August 27, 1935

Metal-Working Machinery

Crank Shaft Grinding Machine. Charles H. Amidon, Worcester, Mass., assigned to Norton Co. Patent 2,012,263.

Blanking and Forming Press and Method of Forming Blanks. Walter Ferris, Milwaukee, Wis. Patent 2,012,423.

Die Casting Machine. Carl Roehri, Chicago, Ill. Patent 2,012,548.

Tools and Attachments

Reversing Mechanism for Machine Tools. Warren F. Fraser, Westboro, Mass., assigned to Norton Co. Patent 2,012,273.

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September 3, 1935

Metal-Working Machinery

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Tools and Attachments

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September 10, 1935

Metal-Working Machinery

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Tools and Attachments

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September 17, 1935

Metal-Working Machinery

Reaming Apparatus. Otto F. Eckroate, Chippewa Township, Beaver Co., Pa., assigned to the Babcock & Wilcox Co. Patent 2,014,679.

Apparatus for Making Cans. Albert V. Sullivan, Redwood City, Cal., assigned to Pacific Can Co. Patent 2,014,706.

Automatic Multiple Crank-Pin Grinding Machine. Herman F. Klingele, Worcester, Mass., assigned to Landis Tool Co. Patent 2,014,768.

Piston Ring End Cutting Machine. Harold P. Phillips, Maplewood, Mo., assigned to Climax, Jones & Quinn Co. Patent 2,014,814.

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Tools and Attachments

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Means for Forming Roller Bearing Cups. Thomas Zimmerman and Albert Schreiber, Detroit, Mich., assigned to Bower Roller Bearing Co. Patent 2,014,605.

Method of Making an Abrasive Tool. George F. Taylor, Schenectady, N. Y., assigned to General Electric Co. Patent 3,014,955.

September 24, 1935

Metal-Working Machinery

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Tools and Attachments

Cutter. John Edgar, Rockford, Ill., assigned to Barber-Colman. Patent 2,015,068.

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American Machinist

REFERENCE BOOK SHEET ©

Lead Gears for Diametral Pitch Worms

C. A. JOHNSON

Perkins Gear & Machine Company

Practically all spur, helical, and bevel gears are now made to the diametral pitch system because of the simplicity of its calculations. Worm gearing has been made to the circular pitch system because of the ease of gearing a machine to produce worms with leads which are simple fractions. This practice is now being gradually superseded by the diametral pitch system. The one disadvantage, that of calculating change gears, is obviated by the accompanying table giving the four gears necessary to produce the correct lead on a worm of any diametral pitch from one to sixty and any number of threads from one to eight.

The diametral pitch is found at the left-hand side of the table, and in the column under the desired number of threads is found the change gears which will produce the correct lead. The table is divided horizontally into three sections. Gearing for the coarse pitches (1 to 4) is calculated for a machine with a 3-in. constant, that is, a machine which will produce a lead of 3 in. with equal gears. The medium pitches (5 to 20) are calculated for a machine with a 1-in. constant, and the fine pitches (22 to 60) are calculated for a machine with a ½-in. constant. In every case the largest gears to produce the desired ratio are given. For some ratios these may be factored if smaller gears are desired. All of the gear ratios in the table are the closest to the desired ratio which may be obtained using gears with tooth numbers from 24 to 100. The required gears are as follows:

3-in. machine—35 gears in all
1 each—24, 25, 28, 30, 34, 35, 36, 42, 43, 44, 47, 48, 51, 55, 60, 61, 62, 68, 70, 72, 75, 77, 84, 85, 86, 88, 89, 95, 98, 99.
2 each—25, 50, 100.

1-in. machine—59 gears in all
1 each—25, 27, 28, 29, 31, 32, 33, 34, 35, 40, 41, 42, 43, 44, 45, 47, 48, 51, 52, 55, 56, 58, 59, 61, 62, 63, 64, 65, 66, 68, 70, 72, 73, 76, 77, 78, 80, 81, 82, 84, 85, 86, 87, 88, 89, 90, 91, 93, 94, 95, 96, 98, 99.
2 each—50, 75, 100.

½-in. machine—62 gears in all
1 each—26, 27, 28, 29, 31, 32, 33, 34, 35, 41, 42, 43, 44, 45, 46, 47, 48, 51, 52, 55, 56, 57, 58, 59, 61, 62, 63, 64, 65, 68, 69, 70, 73, 76, 77, 78, 79, 80, 81, 82, 84, 85, 86, 87, 88, 89, 90, 91, 92, 94, 95, 96, 98, 99.
2 each—50, 66, 75, 100.

It may be necessary to cut a worm on a machine of different constant than that for which the change gears are tabulated. The procedure for finding the correct set of gears is as follows:

Suppose that a 3 D.P. gear is to be cut on a 2-constant machine. The gears for a 3-constant machine are of 34, 75, 77 and 100 teeth. To maintain the same lead on the worm, however, it will be necessary to increase the ratio of the change gears in, the ratio of 3 to 2. Thus, $\frac{3\text{x}34\text{x}77}{2\text{x}75\text{x}100}$, which by factoring becomes $\frac{68\text{x}77}{100\text{x}100}$.

LEAD GEARS FOR DIAMETRAL PITCH WORMS

Diametral Pitch	Number of Threads 1				2				3				4				5				6				7				8				Machine Constant
	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	Driver	Follower	
1	68	50	77	100	68	50	77	50	51	25	77	50	68	25	77	50	85	25	77	50	51	25	77	25	85	24	89	43	68	25	77	25	
1¼	68	84	89	86	68	84	89	43	85	70	89	43	68	42	89	43	68	25	77	50	85	35	89	43	85	30	89	43	100	95	77	43	
1½	68	75	77	100	68	75	77	50	68	50	77	50	68	25	77	75	85	25	77	75	68	25	77	50	85	36	89	43	98	47	75	28	
1¾	68	100	88	100	68	100	88	50	68	50	99	75	68	50	88	50	85	50	88	50	68	25	99	75	68	25	77	50	68	25	88	50	
2	68	100	77	100	68	100	77	50	51	50	77	50	68	50	77	50	85	50	77	50	51	25	77	50	85	48	89	43	68	25	77	50	3
2½	34	84	89	86	68	84	89	86	62	55	68	61	68	84	89	43	68	50	77	50	85	70	89	43	85	60	89	43	68	42	89	43	
3	34	75	77	100	68	75	77	100	68	50	77	100	68	75	77	50	85	75	77	50	68	50	77	50	85	72	89	43	68	75	77	25	
3½	68	100	44	100	68	100	88	100	68	100	99	75	68	100	88	50	85	100	88	50	51	50	88	50	68	50	77	50	68	50	88	50	
4	34	100	77	100	68	100	77	100	51	50	77	100	68	100	77	50	85	100	77	50	51	50	77	50	85	48	89	86	68	50	77	50	
5	62	55	34	61	62	55	68	61	93	55	68	61	68	56	89	43	51	25	77	50	51	28	89	43	85	40	89	43	85	35	89	43	
6	68	100	77	100	68	100	77	50	51	50	77	50	68	50	77	50	85	50	77	50	51	25	77	50	85	48	89	43	68	25	77	50	
7	68	100	66	100	68	100	99	75	51	50	99	75	68	50	99	75	85	50	99	75	68	50	99	50	51	25	77	50	68	25	66	50	
8	51	100	77	100	51	100	77	50	66	58	88	85	51	50	77	50	51	40	77	50	66	29	88	85	77	29	88	85	51	25	77	50	
9	34	75	77	100	68	75	77	100	68	50	77	100	68	75	77	50	85	75	77	50	68	50	77	50	85	72	89	43	68	25	77	75	
10	31	55	34	61	62	55	34	61	62	55	51	61	62	55	68	61	51	50	77	50	93	55	68	61	85	80	89	43	85	70	89	43	
11	51	100	56	100	68	100	84	100	68	100	63	50	68	100	84	50	51	50	98	70	68	50	63	50	51	50	98	50	68	50	84	50	
12	34	100	77	100	68	100	77	100	51	50	77	100	68	100	77	50	85	50	77	100	51	50	77	50	85	48	89	86	68	50	77	50	
13	32	73	43	78	41	65	59	77	48	73	86	78	85	91	89	86	51	50	77	65	96	73	86	78	85	52	89	86	85	91	89	43	1
14	51	100	44	100	68	100	66	100	51	50	66	100	68	100	99	75	85	100	99	75	51	50	99	75	51	50	77	50	66	50	68	50	
15	42	94	45	96	34	84	89	86	62	55	34	61	68	84	89	86	68	50	77	100	62	55	68	81	68	96	89	43	68	42	89	86	
16	33	85	44	87	51	100	77	100	66	87	66	85	51	50	77	100	51	50	77	80	99	87	88	85	77	58	88	85	51	50	77	50	
17	42	100	44	100	56	100	66	100	84	100	66	100	84	100	88	100	84	100	99	90	84	100	99	75	98	100	99	75	84	75	99	75	
18	31	99	34	61	34	75	77	100	68	100	77	100	68	75	77	100	51	50	77	90	68	50	77	100	85	72	89	86	68	75	77	50	
19	32	70	34	94	41	77	59	95	43	73	80	95	63	76	75	94	82	77	59	76	86	73	80	95	85	76	89	86	63	76	75	47	
20	27	64	35	94	31	55	34	61	55	95	70	86	62	55	34	61	51	50	77	100	62	55	51	61	85	80	89	86	62	55	68	61	
22	51	100	56	100	68	100	84	100	68	100	63	50	68	100	84	50	51	50	98	70	68	50	63	50	51	50	98	50	68	50	84	50	
24	34	100	77	100	68	100	77	100	51	50	77	100	68	100	77	50	85	50	77	100	51	50	77	50	85	48	89	86	68	50	77	50	
26	32	73	43	78	41	65	59	77	48	73	86	78	85	91	89	86	51	50	77	65	96	73	86	78	85	52	89	86	85	91	89	43	
28	51	100	44	100	68	100	66	100	51	50	66	100	68	100	99	75	85	100	99	75	51	50	99	75	51	50	77	50	66	50	68	50	
30	42	94	45	96	34	84	89	86	62	55	34	61	68	84	89	86	68	50	77	100	62	55	68	81	68	96	89	43	68	42	89	86	
32	33	85	44	87	51	100	77	100	66	87	66	85	51	50	77	100	51	50	77	80	99	87	88	85	77	58	88	85	51	50	77	50	
34	42	100	44	100	56	100	66	100	84	100	66	100	84	100	88	100	84	100	99	90	84	100	99	75	98	100	99	75	84	75	99	75	
36	31	99	34	61	34	75	77	100	68	100	77	100	68	75	77	100	51	50	77	90	68	50	77	100	85	72	89	86	68	75	77	50	
38	32	70	34	94	41	77	59	95	43	73	80	95	63	76	75	94	82	77	59	76	86	73	80	95	85	76	89	86	63	76	75	47	½
40	27	64	35	94	31	55	34	61	55	95	70	86	62	55	34	61	51	50	77	100	62	55	51	61	85	80	89	86	62	55	68	61	
42	34	100	44	100	68	100	44	100	68	100	66	100	68	100	88	100	85	100	88	100	68	100	99	75	68	100	77	50	68	100	88	50	
44	34	100	42	100	51	100	56	100	68	100	63	100	68	100	84	100	85	100	84	100	68	100	63	50	51	50	98	100	68	100	84	50	
46	26	69	29	80	32	69	43	73	64	92	43	73	63	92	75	94	82	92	59	77	64	92	86	73	85	92	89	86	63	46	75	94	
48	26	79	35	88	34	100	77	100	51	100	77	100	68	100	77	100	85	100	77	100	51	50	77	100	85	96	89	86	68	100	77	50	
50	27	94	42	96	28	57	44	86	56	95	55	86	56	57	44	86	62	55	34	61	56	57	66	86	85	100	89	86	56	57	88	86	
56	34	100	33	100	51	100	44	100	51	100	66	100	68	100	66	100	85	100	66	100	51	50	66	100	51	59	77	100	68	100	99	75	
60	27	94	35	96	42	94	45	96	31	55	34	61	34	84	89	86	68	100	77	100	62	55	34	61	70	82	79	92	68	84	89	86	

In Another Job Shop

Charles Weslow

I got another job in another jobbing shop on account of having no more work in the first place. They have linoleum on the floor; but that's on account of the condition of the floor boards. It's a nice shop, with modern equipment, on the second floor of a two-story brick building, windows all around, with the building covered all over with creeping ivy, which sends forth an aroma of pure oxygen, that blows right into the shop windows in summer. It is on the outskirts of the town of Bloomfield, N. J.; no smoke from nearby factories.

In the course of the first two weeks that I have been there, my appetite has increased 40 per cent. No one could blame Boss Mathewson, for maintaining pride in his shop. When we get through using a machine, we just notify the porter who promptly cleans the machine all over and sweeps up the chips.

Come Friday night all hands get busy washing the machines all over with kerosene. It's a half hour the boss well spends on the machinery and bench plates.

A cast aluminum plate cam is about 18 in. long, 10 in. wide and $\frac{3}{4}$ in. thick, with ribs on one side extending $\frac{5}{8}$ in., with a few spots for holes. One side of the plate had to be machined, scraped, lapped and polished to within 0.001 in. plane—almost as plane as a B. & S. surface plate.

After the first cut over the plane surface in the shaper, it warped out of shape, but this was corrected considerably by pounding on it with a lead hammer. Then it was machined on the other side where counterboring was to be done. Then it was straightened again, saw slots cut through the plane surface, $\frac{1}{4}$ in. deep, straightened again gently, and finally the plane surface was milled off as smooth as the operator knew how to do it; straightened again and scraped to the B. & S. surface plate. Then came the problem of polishing.

I suggested to the foreman that I be given that part of the job to do, but instead, he induced me to tell what I knew about it. I brought in a block of balsa wood about 4 in. square, 1 in. thick, one end sandpapered smooth, and also a handful of fine pumice stone pulverized, which I instructed the toolmaker on the job to use with water, using the block as a lap. The plane came out satisfactory.

A Lapping Stunt

The idea of using balsa wood occurred to me on account of its being hard enough on the end to maintain a good surface, while at the same time, it was soft enough to allow free movement of pumiced water to avoid scratching.

They gave me a job turning six dozen counterbores, as specified in the sketch herewith. Considering the vast experience I have had in my time, such work to me is a cinch.

The material is high-speed steel, and that is tough turning. The tool bit gets dull easily and must be sharpened after fifteen minutes use.

Here's how I did the job. The pieces came to me sawed off long enough to allow for finishing the ends. First operation was to hold them in a three-jaw chuck and face them off both ends, allowing $\frac{1}{64}$ in. until the steps were rough turned to within half a 64th for finishing. When it was evident that the steps would all finish to the specifications, the other or back end, was faced off so that there would be enough to grind 0.010 in. Five thousandths on that kind of material would have been enough to grind out the small blisters that are generally left behind in the hardening of such steel, but it was best to leave enough on in case the side tool used to face the steps scratched, remembering that the face of the steps had to be turned smooth without any chatter marks whatever. Such a tool must be adjusted so as to have very little bearing surface in order to turn a smooth finish.

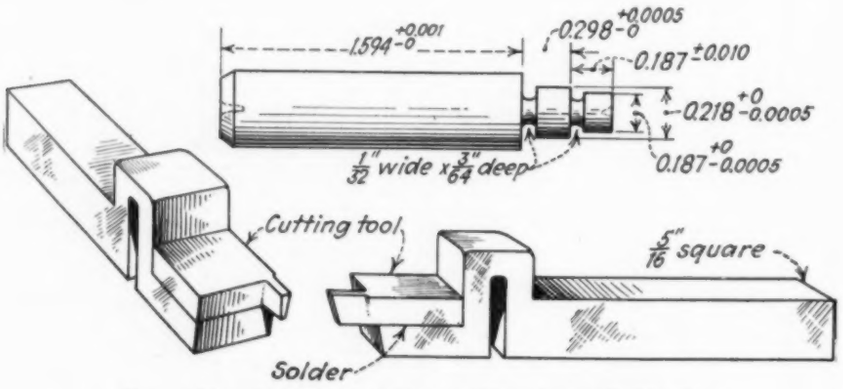
After the back ends were faced off, as aforesaid, the parts were centered in the chuck, using a combination center reamer fastened in a drill chuck in the tailstock of the lathe. All centers were as near alike as the naked eye could behold—no mechanical reason for it, but such a number of pieces look better when the centers are alike.

A homemade dog, made to drive them on the bench lathe centers, had a short tail so that in revolving it did not strike the slide rest, which an ordinary bitch dog might.

Oil—Not Lead

No white lead, red lead or any other kind of lead was used on the dead center, because such materials tend to clog up the center holes, and who can tell but maybe a small harmful chip is hiding in that mess of lead, way back in the center hole. Every time I removed a piece from the centers, I wiped off the dead center with my thumb and forefinger and also the end of the work and cleaned out the center hole with the reamer that reamed them. Instead of lead, it is best to use plain machine oil, which can be kept somewhere on the lathe bed, but care must be taken not to let the few drops of oil squirted thereon get dirty. To make sure, every once in a while wipe away that oil and apply clean oil to the dead center with the finger. The center in the work will pick up enough oil from the dead center.

It takes a lot of experience to learn how to turn small parts like these so as to leave only 0.00125 in. to finish with a No. 4 narrow pillar file. And it takes considerable experience to learn how to handle the file on the revolving work without filing too much off one end of such short dimensions as shown.



For necking the work, this 30-year old spring toolholder has the advantages of not chattering or breaking the toolbit

Nothing but fine emery cloth was used to finish the ends of the steps, doubled up and held against the work with the fingers.

The necks were cut in with a small spring toolholder. A solid tool bit would not only chatter in such a depth but would likely break off. The spring toolholder, which is always used, I made some 30 years ago out of tool steel. Many a piece of turning tool steel have I soldered onto the toolholder with just solder. The sketch of the counterbore shows a chamfer on the back end. It is not turned off until all the steps are finished, because a sharp corner must be there in order to be able to hold a micrometer in place to measure the lengths.

Modernization Makes Business

WILLIAM K. STAMETS

To represent his manufacturers in the sale of their products is only one of the functions of a machine tool dealer. He must also understand his customer and be unbiased with the customer's problems.

The past five or six years have been tough ones for the metal-working industry, with constant shrinkage of reserves and depletion of inventory. With this situation staring a plant executive in the face, he is likely to be rather cold blooded in his appraisal of the modernization movement. In the first place, he may not have the cash resources to modernize his plant; and secondly, he may be reluctant to assume more debt without something more tangible than the machine tool salesman's promise of substantial savings. First, he wants to see orders that can be handled at a profit. Then, if the margin and volume are sufficient, he may feel justified in purchasing modern equipment for the job.

In this connection, there are three classes of machine tool equipment to be considered; namely, production tools, maintenance tools, and large standard tools. Production tools depreciate relatively fast for two reasons: first, because they are generally driven to or beyond their capacity for long periods; and second, because obsolescence overtakes them quickly as a result of the greater research and development activity in this category.

Maintenance tools, such as toolroom equipment, on the other hand, depreciate less rapidly for obviously reverse reasons. The machine hour rate and productivity of such tools bear about the same relations to manufacturing costs as do office salaries—they are looked upon as a necessary evil, at best. Inefficiency is frequently passed over because of the supposed minor effect it has on the aggregate of manufacturing costs. On large standard tools such as planers and boring mills, it is difficult to show the replacement value because of the class of work on which they are employed and because the set-up time is such a large part of the total time on most jobs.

When business is good the average manufacturing executive can and does easily find reasons to justify the purchase of modern production equipment; but when he has little or no work, and it is not within his power to create it, he cannot be induced to modernize merely for the sake of being up-to-date. If his business is dependent upon some other business which also is in the doldrums, then there is nothing to be done about it.

If we rationalize the subject of modernization, we cannot but reach the conclusion that we only need more business activity, and modernization will take care of itself—progress will demand it.

Increased activity will probably come slowly unless, of course, more of the major industries take a page from the book of the automobile manufacturers who saw the potential market and plunged to meet it with confidence and smart merchandising. They gave the public better automobiles at lower prices; and the public responded beyond their expectations. The same stroke of business acumen, applied in other lines, should find similar response.

Vigilance Reduces Accidents on Punch Presses

Six lost time accidents in ten years is the excellent safety record achieved in the punch press department of the L. C. Smith Typewriter factory. As reported by the Power Press Section of the National Safety Council, during five years of this period, no lost time accidents occurred.

These results are attributed to the following practices:

1. Inspect machines and safeguards every day and see that defects or improper adjustments are corrected.

2. Use compressed air instead of fingers to eject parts if possible; otherwise use a hook or other tool.

3. Teach operators the best and safest way to work and interest them to follow instructions and shop rules for the reason that violation causes accidents that are painful and costly to operators.

4. Employees should report to the foreman any unsafe condition or practice of any kind as soon as noticed.

5. Die setters and supervisors have responsibility to see that the press and safeguards are in correct adjustment and safe operating condition and that the die is set right to produce the work in hand.

6. Do not surprise or startle anyone working on a punch press; when it is necessary to talk with an operator working on any hazardous operation have the operator stop work instead of dividing his attention.

Show Sidelights

I liked at the Machine Tool Show:

The "Roxy" lighting on the feed dial of Gray's milling planer . . . S.K.F.'s new bouncing ball act with eight surface plates . . . The "great outdoors" aroma from the pine oil in the cutting compound of Cincinnati's centerless lapper . . . The "Hula" motion on the wheel of the Gleason gear grinder . . . Illuminated machine views built into the Heald booth desk . . . Warner & Swasey's working model of the McDonald laboratory . . . The picturesque effect of the ruby glass guard around G.E.'s welding demonstration.

The cast iron robins on the Civil War vintage Putnam planer in the Edison Institute historical exhibit . . . Also the name plate on the same machine "E. P. Bullard, Dey St., New York" . . . The built-in lighting on Pratt & Whitney's die sinker . . . Marlin Rockwell's automatic machine for sorting balls to 0.0001 in. . . . The pint-sized drop hammer at work on the lens of a "Drednaut" safety goggle . . . Norton's large photographic wall panels.

Integral feed and speed indicators on the Lodge & Shipley "Transitorq" lathe . . . The show's biggest unit—Ingersoll's horizontal boring, milling, drilling and threading machine . . . The Hyatt railroad journal roller bearing floating in space . . . The blonde in the Oster-Williams booth . . .The made-while-you-watch ashtrays on the V. & O. press . . . Charles J. Stillwell's optimistic forecast—$70,000,000 worth of orders in the next six months.

Ideas FROM PRACTICAL MEN

A Quick-Acting Clamp

OCTAVE ANTONIO
Tool Supervisor,
Ann Arbor Automatic Products Company

The quick-acting clamp illustrated in Fig. 1 is used for clamping work that is nested in a V-block in the fixture, as at *A*. The threaded cylinder *B* is slotted similar to a bayonet lock and is screwed into the block *C*. The pin *D* in plunger *F* engages the slot in the cylinder so that when the plunger is rotated in either direction by the knob *H*, the cylinder will be screwed in or out.

In clamping the work *I*, plunger *F* is pushed forward into contact with it and is rotated clockwise by knob *H*, bringing pin *D* into contact with one side of the slot, rotating the cylinder and clamping the work.

In unclamping the work, the knob is rotated counterclockwise, bringing pin *D* into contact with the opposite side of the slot, rotating the cylinder and unclamping the work. Pin *D* is now in the straight part of the slot and the plunger can be pulled straight back, leaving space for removing the work and inserting a new piece.

An alternate design is shown in Fig. 2, in which the V-block *A* is carried on the end of plunger *B*, but does not rotate with it. The plunger is threaded into cylinder *C*, which turns freely in block *B*. The threads on the plunger are a close fit in the threads of the cylinder, so that when the plunger is rotated by the knob *F*, the cylinder rotates with it by friction. The cylinder has a slot similar to a bayonet lock, in which the pin *H* in block *D* engages.

In clamping the work, the plunger is pushed forward, bringing V-block *A* into contact with the work. Rotating knob *F* clockwise rotates the cylinder until it is stopped by pin *H* contacting one side of the slot. Further rotation of the knob draws the cylinder back against pin H, which is now in the notch of the slot, and screws the plunger forward enough to clamp the work.

In unclamping the work, knob *F* is rotated counter-clockwise until it is stopped by pin *H* contacting the straight part of the slot, unscrewing the plunger and unclamping the work. The plunger can now be pulled straight back, leaving room to remove the work and insert a new piece.

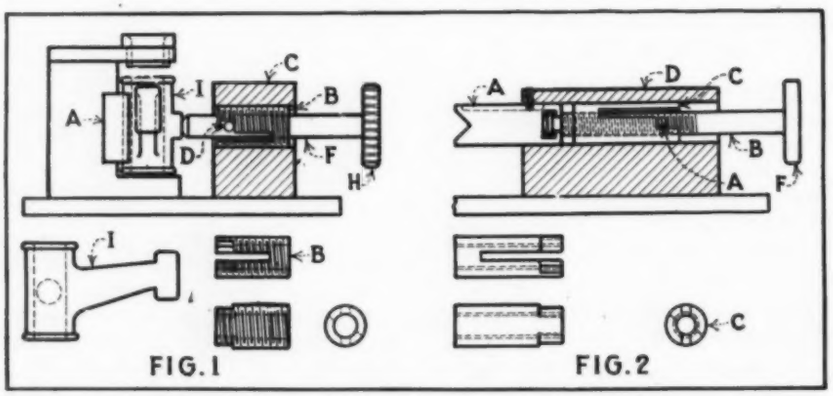


FIG. 1 FIG. 2

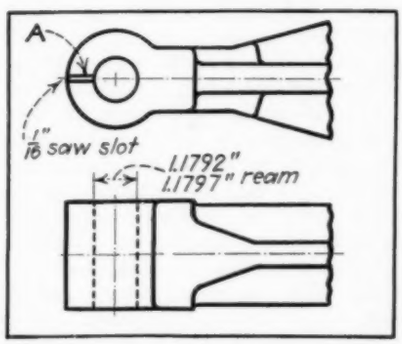
Quick action in clamping is accomplished by pushing the plunger forward into contact with the work and then rotating it part of a turn by the knob at the end

Slots Did It—Why?

CHARLES C. TOMNEY
Chief Tool Designer,
Carrier Engineering Corporation

On reading Charles Doescher's discussion of the article under the above title (*AM*—Vol. 79, page 468), it occurred to me that it might be of interest to the readers to know how we keep the piston pin ends of our eccentric rods tight on the piston pins. We tried setscrews and other means, but found that slotting the rods was less costly and gave entire satisfaction. If we did not slot the rods we could make the pins tight enough, but the pins would have to be a drive fit in the rods, which would make it difficult to assemble the parts and to take them apart when overhauling the machine after using it for several seasons.

Bushings are keyed to the ends of the piston pins, so that they can not turn on the pin, but turn with it. After machining the eccentric end of the rod, the piston pin hole is bored and reamed a few thousandths under size, so that it can be burnished to the size given in the drawing, which is shown herewith. The slot *A* is then cut and the hole is closed in a small amount so that the piston pin is a "tap-in" fit with a soft hammer. We found that under these conditions the



If the piston pin is a close fit in the eccentric rod, it has been found that slotting the rod as shown, tends to tighten it on the pin

rod always tended to tighten on the pin and prevent it from turning in the rod.

I can remember half a dozen cases only where parts were returned because the piston pins turned in the rods, and the trouble may have been caused by not keeping the oil up to the proper level, because the bushings had seized in the pistons.

J. T. TOWLSON
London, England

A little unconsciously perhaps, Frank C. Hudson has opened an interesting problem.

The connecting rod referred to is presumably of steel and the bushing of non-ferrous metal has a greater coefficient of expansion than has the rod. In use, the bushing gets warm—even hot. It tries to expand but cannot, because of the comparatively heavy section of the rod. Consequently the

bushing is compressed, causing the diameter to be less when cold than it was originally, and is obviously loose in the rod.

However, if the bushing is slotted, the slots provide means for its becoming distorted when hot without the density of the metal being increased, and the slots close in slightly. This being the case, the bushing has no tendency to become loose when it is cold.

O. D. BRADSHAW
Fredericton, N. B., Canada

It is commonly known that when a plain bushing is pressed into a connecting rod and is put to work under a heavy load, the frictional heat tends to expand it slightly. Under certain conditions the heat may be great enough to loosen the bushing because, under expansion, the metal has no freedom and the grains are crowded closer together, and when it cools it becomes loose in the rod. Once this happens, the crankpin hammers the bushing against the wall of the hole and loosens it.

The bushing shown by Mr. Hudson has a small amount of spring tension when pressed into the rod. If it were possible to measure the width of the slots at top and bottom, it would be found that they were slightly narrowed at the top. Therefore, the heat of friction compresses the slots still further and puts a greater tension on the metal, with the result that the bushing will absorb more heat, and when it cools it will have a preloaded tension to keep it tight.

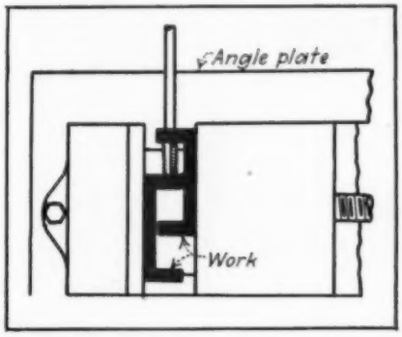
The slots also permit ample space for the lubricant; that a clean film of oil may always be between the bushing and the crankpin, thus reducing frictional heat.

Increasing the Effective Length of a Tap

FRANK MOORE
Hamilton, Ontario, Canada

We had to drill and tap some channel pieces through both flanges near the ends, the threads to be continuous in both flanges. Our taps were of standard length and the threaded parts were too short to reach from one flange to the other, so that the tap would be out of one flange before it entered the other and the lead of the thread would not be continuous.

We got over the difficulty by holding two pieces at one time in a machine vise, as shown in the illustration, clamping the vise to an angle plate. The shank of the tap was lengthened by welding on a piece of drill rod. By this method of holding, the tap entered the flange in one piece before leaving the flange in the other, and so produced a continuous thread in both flanges of each piece.



By holding two channels in reverse position in a machine vise, the tap was made to tap a continuous thread in both flanges of each channel

An Efficient Tap Wrench

HERBERT M. DARLING
Superintendent, Wells Tool Company

Clarence Holland suggests the use of a bit brace for retapping and cleaning out tapped holes (*AM*—Vol. 79, page 565).

The accompanying sketch shows a quick-action tap wrench that we have found useful in the assembly department for the kind of work referred to by Mr. Holland.

It is an ordinary ¼ to ¾-in. capacity tap wrench having the yoke *A* welded to the wrench and extending 4 in. above its center. A brace-bit knob is pivoted on top, as shown. It can be used in the ordinary way to drive the tap into the hole, but when cleaning out tapped holes or backing the tap out of a tapped hole, the knob is held by one hand and with the other hand the wrench is given a sharp twirl to back out the tap quickly. This tool is a time saver on the assembly floor.

By holding the pivoted knob with one hand and giving the wrench a sharp twirl with the other, the tap can be quickly backed out of the hole

An Improvised Punch Press

STANLEY BALDWIN

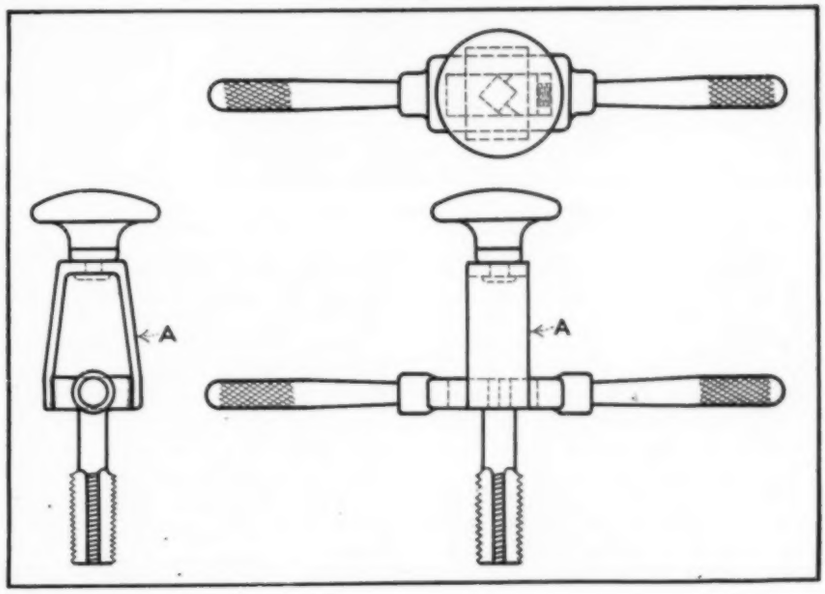
We needed a few hundred small disks of thin sheet metal. As we had no punch press, and making them by the snips and file process was too slow and expensive, we made them in a drill press of the lever feed type by means of temporary tools.

A temporary die was made by drilling a hole of the size of the disks wanted in a block of cold-rolled steel. The punch was a short piece of drill rod ground square on one end and held in the drill chuck.

With the temporary die aligned with the punch and clamped in place, the disks were easily punched by bringing the drill-press spindle down quickly with the lever.

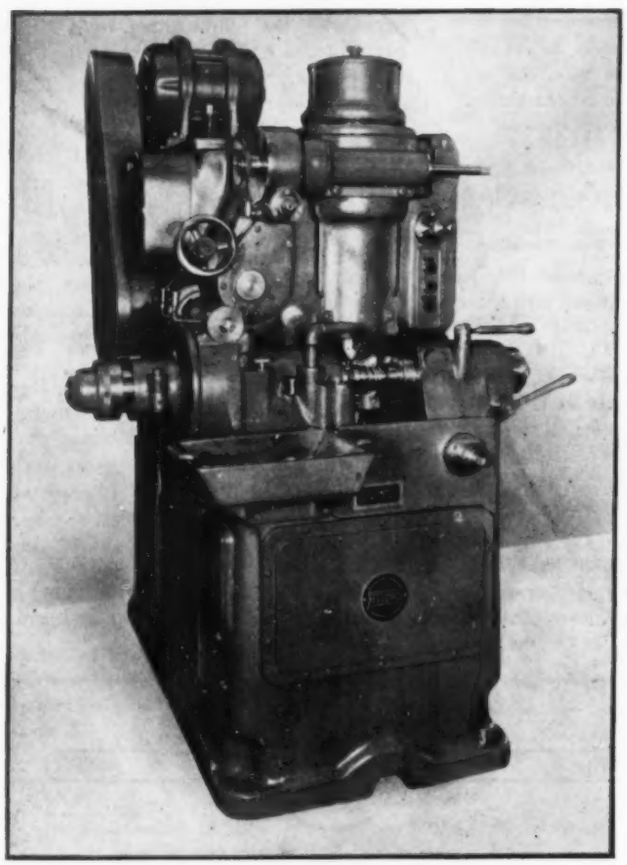
We have used such tools for cutting out intricate shapes in sheet metal, using the drill press as a nibbling machine. Other kinds of light press work in thin metal can be done by making temporary tools to suit the jobs.

Extending, lancing, embossing and small shell drawing may be handled in a similar way by designing punches and dies to suit these particular operations.

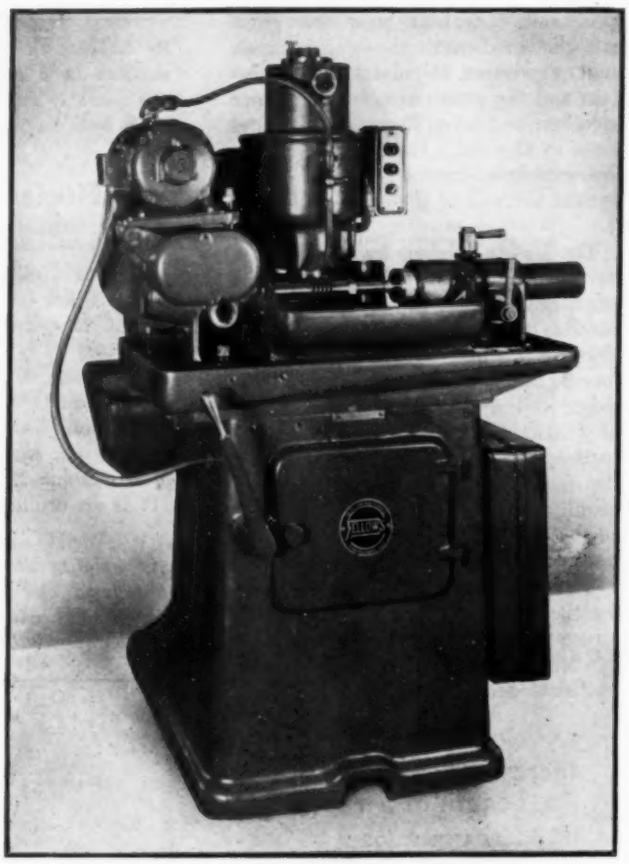


Shop Equipment NEWS

Fellows No. 6 Hourglass Gear Shaper and Worm Lapping Machine



No. 6 hourglass gear shaper



Lapping machine for straight worms

Particularly adapted to motor drive and electrical control, the No. 6 hourglass gear shaper, developed by the Fellows Gear Shaper Co., Springfield, Vt., is easy to set up and operate. A feature of design and construction is its ability to produce worms of great accuracy and smoothness of finish, at a high rate of production.

The cutter rotates in mesh with the work, and reciprocates at the same time that it is feeding into the required depth. Work makes one complete revolution after the cutter has reached full depth, thus producing the smooth finish.

Depth of feed is controlled by a feed cam, which advances the cutter toward the work at a definite rate. This cam is provided with a dwell for the finish cut. The same cutter is used for roughing and finishing. A relieving mechanism withdraws the cutter from the work on the return stroke.

Saddle carrying the cutter-spindle is mounted on trunnions, permitting it to be run back and forth for the cutting and return strokes of the cutter. Provision is made through change gears for cutting different numbers of teeth or threads, and for different depth and rotary feeds. There is also a feed reversing device for changing direction of rotation of the cutter-spindle for cutting worms having right- or left-hand threads.

Another product of this company is a lapping machine for lapping straight worms after hardening or grinding. It employs a throated cast-iron worm wheel as a lap. Work is held on an arbor, and the latter is mounted between a driving and live center. The live center is mounted on ball bearings which are completely sealed to prevent the entrance of lapping compound.

The table carrying the work is reciprocated by a crank mechanism operated by a $\frac{1}{3}$-hp. motor and reduction gear unit. Travel of the table is adjustable for stroke length. Headstock center is positively driven by a $\frac{1}{2}$-hp. motor through change gears. Worm-wheel type lap is rotated by the work, and an adjustable brake on the

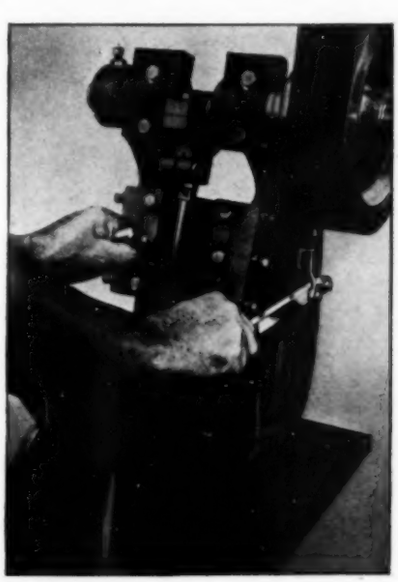
lap-spindle is provided to furnish the necessary resistance to expedite the lapping action. The machine is provided with definite time relays, connected with the headstock motor, to control the number of revolutions of the work in either direction for lapping both sides of the thread.

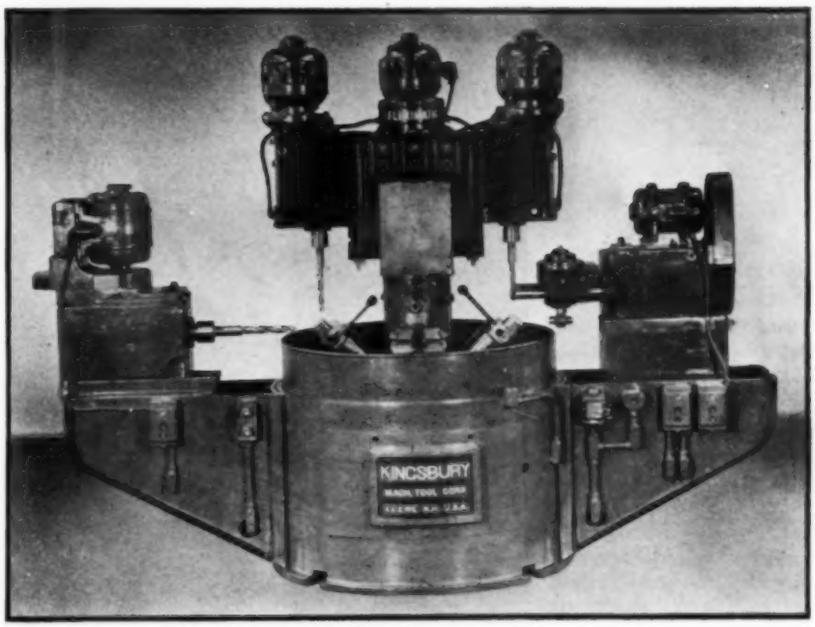
When it is used for lapping worms after hardening, the lap is made from fine grain cast iron, and a coarse abrasive is used. When the machine is employed for lapping ground worms, the laps are made of pressed cork, and a fairly fine grain abrasive is recommended.

Lapping compound is mixed with a non-fluid oil, which keeps the abrasive in suspension. The compound is pumped directly to the lap and work by a ¼-hp. pump. Capacity is 4-in. pitch diameter and 5-in. thread length.

"Rousselle" Safety Device for Punch Presses

The press safety device introduced by the David J. Ross Co., Benton Harbor, Mich., is adaptable to practically all sizes and makes of hand-operated punch presses. It consists of a bar, a one-piece housing, an operating lever and a long-life spring. A touch on the safety lever with the left hand, when the press is tripped by the right, releases the punch press lever. Both hands must be in use and out of the way of danger every time the press is tripped. The device springs back into place when released, locking the punch lever securely. The device cannot be put out of action, tied down or easily taken off. A one-piece housing prevents tampering.





Kingsbury "Fleximatic" Station-Type Drilling Machine

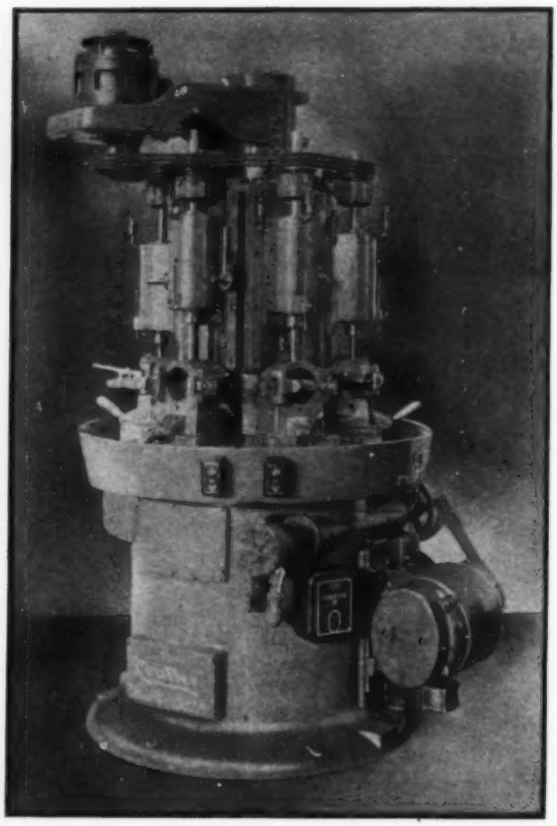
Designed to perform drilling, milling, threading or analogous operations at an exceptionally high rate of production, this center column, automatic indexing type machine, announced by the Kingsbury Machine Tool Corporation, Keene, N. H., is adaptable to a large variety of work. This is due to the fact that the units which make up the machine are equipped with self-contained drive and feed and can be readily located to suit the requirements of various jobs. These units are also available separately for different types of set-ups. Each head is adjustable longitudinally in a dovetail adapter through a screw. It is clamped in position through a single binding lever located at the top of the head. The clutch may be held disengaged so the cam can be turned by hand.

The rotary table or turret is automatically indexed with harmonic motion in from one to two seconds by a torque motor operating through worm and planetary gearing. Table is indexed slightly past its set position and then the motor is reversed to back the table against a registering pawl. It is then locked in position by the torque of the motor, although the voltage is then greatly reduced by a transformer to avoid excessive heating. Because the table is indexed away from the registering pawl, there is no sliding contact of the locating surfaces and consequently no wear to impair the accuracy of the location of the table.

Drilling units are tripped electrically through specially designed solenoids, as the indexing motor reverses to lock the table in its set position. The table can be indexed only when all spindles are in their retracted positions.

For governing the method of operation of the machine, a three position switch is provided. When in the first position, the table will index as a unit when the longest cycle completes its operation. When in position two, the operator must trip the machine with a pushbutton for each complete cycle of operations. In the third position, the table can be inched out of its set position. This feature permits the moving of fixtures from their working positions to facilitate changing tools. This machine can be furnished for from four to eight, or more, indexes of the table per revolution. Double indexing can be provided.

Lubrication of all moving parts is automatically obtained from a pump in the base. A window at the front of the column shows whether or not there is the proper flow of oil. A sump collects the excess oil which is filtered before being redistributed. The rotary table is 36 in. in diameter with finished surface for fixtures 32 in. in diameter. Height of this surface from the floor is 33 in. Outside diameter of the central base is 48 in.



Shown set up for diamond boring of wrist pin holes in pistons, the Type B-131 boring machine may be adapted to production boring of a wide variety of similar parts

Coulter Vertical Multi-Spindle Boring Machine

Type B-131 is the designation given by the Automatic Machine Co., Bridgeport, Conn., to the vertical, six-station, revolving, turret-type diamond tool boring machine illustrated. The machine is designed for large quantity machining of bearing holes in connecting rods, pistons, bushings, valves, refrigerator units, motor end shields, magneto housings and similar parts. Machine in the illustration is arranged for the diamond boring of wrist pin holes in pistons. Fixtures are of the manually operated type equipped with locators, clamps and ejectors.

Power is taken from the spindle motor by means of V-belts contacting all boring spindle sheaves. As the turret revolves, the sheaves leaving the finished work position gradually move out of contact with the V-belts, and are stopped by cam-operated friction brakes, before they reach the unloading station. Spindles leaving the loading position start to revolve before they reach the first boring position, because their sheaves make advance contact with the V-belts. Thus, the boring spindles continue to revolve from the time they leave the loading station until the boring operation is completed and the unloading station is reached.

Spindles are splined to permit the rise and fall of the spindle head, a movement which is controlled by the feed cam mounted on the stationary control column. A bronze shoe rides on the cam and the feed is by gravity. Spindles run in micrometer-adjustment ball bearings.

Power for the operation of the turret and other mechanism is transmitted through V-belts from a motor on the base of the machine through a horizontal worm shaft. On the other end of the worm shaft, at the left, power is taken off to drive the lubricant pump and the coolant pump which has a capacity of 16½ gal. per min. Coolant is pumped through an annular distributor which cuts it off during the portion of the cycle when a spindle is at the loading position. Boring bar lubrication is separate from the machine lubrication and is controlled by sight-feed oilers.

Spindle speeds up to 4,000 r.p.m., are obtainable from the 5-hp. 3,600-r.p.m. spindle motors. The turret motor is 2 hp., and runs at 900 r.p.m. Turret speed is 1½ r.p.m. The machine illustrated will bore nine automobile pistons per minute.

"Ettco-Emrick" Tapping Attachment

A tapping attachment, known as the "Ettco-Emrick," for use on drill presses, portable drills, electric motors and special machines with speeds up to 2,000 r.p.m., has been introduced by the Ettco Tool Co., 594 Johnson Ave., Brooklyn, N. Y. Two sizes are available, No. 100 for $\frac{3}{16}$-in. taps and No. 200 for ¼-in. taps.

Sensitive cone friction clutches are used to drive the tap. They are so proportioned that they will slip before breaking the tool. Reverse speed ratio is 1¾ to 1. The entire mechanism is contained in an oil-tight case and runs in an oil bath. Oil is circulated to all parts by a system of baffles forming a centrifugal pump. A sight glass is provided in the case to gage the oil level.

Cone clutches are made of a material with an oil- and wear-resistant asbestos-carbon friction surface which maintains its co-efficient of friction when running in oil. All gears are helical with compound reversing idlers to balance the thrust. Ball bearings are used for the driving and reverse clutch shells. Idler gears run on nitralloy shafts with leaded bronze bushings to which oil is pumped.

Cleveland Multiple-Spindle Bar and Chucking Machines

Made to obtain tool-room accuracy in production, the Model K multiple spindle bar and chucking machines, introduced by the Cleveland Automatic Machine Co., 2268 Ashland Road, Cleveland, Ohio, embody similar principles of design and construction, including speed, precision and convenience of tooling set-up and same sturdy one-piece bed construction. A nickel alloy bed frame with spindle and tool turret bearings cast integral provides rigidity, eliminate torsional strains and vibration, assuring accuracy and permanence in alignment between spindles and turret tools.

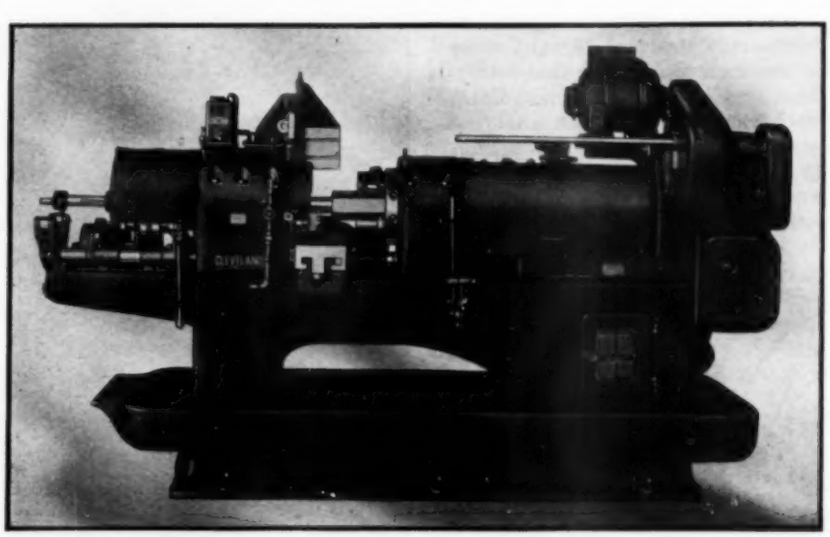
Steel-body air chucks are operated by duplex air cylinders, mounted on each spindle, and revolve on anti-friction bearings. A distinctive feature of air control is the single air valve which permits one chuck to be opened and closed for loading, maintaining constant pressure in the other cylinders.

Each spindle driving gear is equipped with a disk clutch mechanically operated from the camshaft to stop and start the spindles in the loading position as the spindle turret indexes. When parts to be machined can be handled with the magazine feed, the air control valves can be set to automatically open and close the chuck in the loading position, permitting full automatic operation. The main slides are actuated by double bell cranks from the upper camshaft and carry the tools for the lower spindles. Top slides are operated by steel cam bars in the slide base acting directly on a roll in the center of the working slide, affording extra tool positions for forming, shaving and cutting-off. Stop screws in each slide insure duplication of work from each spindle.

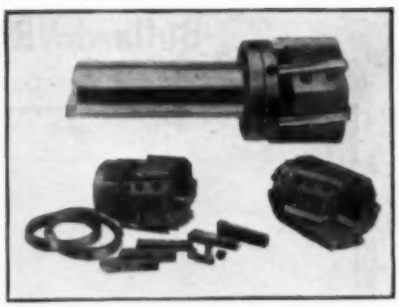
Accelerated tool spindles for drilling, boring, reaming and threading operations are mounted in the main tool turret and operated by levers fulcrumed from the mast bracket. The levers are actuated by cams bolted to the operating drum. As the movement of the spindles is independent of the main tool turret feed they can be synchronized so as to complete their operation within the cutting time of the other tools.

Travel of the tapping spindle is controlled by a positive trip mounted over the threading drive that trips the locking device, automatically shifting the clutch from slow to fast drive at the end of the tapping stroke. This permits full depth tapping to the bottom of blind holes or shoulders, lessening tap breakage.

Distinctive features of these machines are: sturdy one-piece bed construction, cam drums located at rear of machine, visible cam control and accessibility to tooling from front or rear, combination tool turret affording eight or twelve tool positions, positive conrtol of tapping spindle with instantaneous trip and all spindle bearings oiled by automatic force-feed lubrication.



Available in fourteen sizes from ⅜ to 3¼ in., four-spindle, and eight sizes from ⅜ to 2¼ in., six-spindle, this bar machine is designed for accurate production work



Pratt & Whitney "Camlock" Serrated-Blade Reamers

"Camlock" reamers, placed on the market by the Pratt & Whitney Co., Hartford, Conn., are available in both shell and shank types.

Serrations on one side of each blade fit into the corresponding serrations in the reamer body. Two cams lock each blade in place. Nuts at the back end of each blade permits easy adjustment for size. Parallel bearing surfaces of serrations and large areas of contact, as compared with plain blade reamers, allow the alignment and positioning of blades in the reamer body to be maintained accurately and positively.

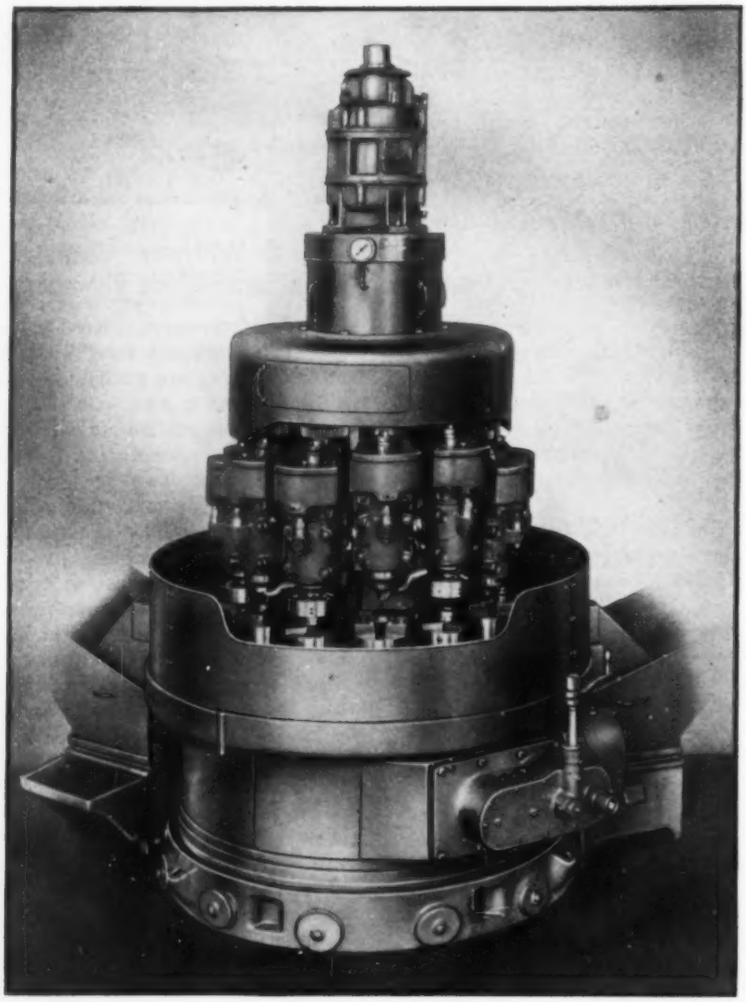
In all types of "Camlock" reamers, the blades are pushed forward to increase the cutting diameter. This permits the reamers to function equally well in through holes, blind holes or against shoulders. To increase the cutting size the two nuts are loosened and backed away from the ends of the blade and all cams are loosened by a clockwise turn. A quarter turn of the adjusting nut forward increases the reamer diameter 0.0003 in.

The serrations play an important part in size adjustment. Instead of requiring blades to project an abnormal or impractical distance from the body, it is only necessary to slip the blade into the next serrated stop when a considerable size increase is required. Size range, 1¼ to 6 in.

"Doler-Brass" Die-Casting Alloy

"Doler-Brass" announced by the Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y., contains copper, zinc and silicon. It is especially adapted to the die-casting process and has the following physical properties: Tensile strength, 65,000 to 75,000 lb. per sq.in.; yield point, 30,000 to 40,000 lb. per sq.in.; elongation, 20-25 per cent in 2 in.; reduction in area, 20-25 per cent; brinell hardness, 110-120; impact strength, 30 to 36 ft. lbs.; color, light yellow.

Bullard "Roto-Broach"

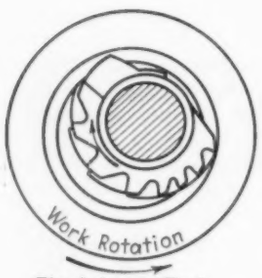


"Roto-Broaching," announced by the Bullard Co., Bridgeport, Conn., is the subjecting of the work, while rotating at cutting speeds, to the action of the tool, the blade edge, or edges, of which are arranged to approach the work surface at an angle with respect to the axis of the work and at a relatively low speed so that the cutting action passes along the blade from point to point axially of the work. In this way, no one point of the blade is subjected to a continuous strain or a continuous heat for an excessive time interval.

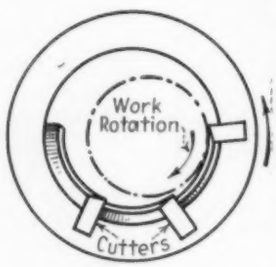
Machines employed for the Roto-Broach vary with the work and production requirements, but in general they must provide the proper means for rotating the work at cutting speed and also moving the tool relative to the work. The accompanying illustration shows a Bullard 12-spindle "Contin-U-Matic" equipped with both internal and external Roto-Broaches. Six spindles continuously rough and finish internally, while the other six rough and finish externally.

In some instances, the Roto-Broach cutter blades may be arranged to pass tangentially of the periphery of the work. In other instances, a circular series of blade edges may enter internally or surround externally the circular work piece to accomplish turning of either interior or exterior surfaces. There may be several diameters, including angles or radii, the cutters conforming in design to the requirements. The blade edges are preferably in parallel. Each blade has a decided clearance angle, thereby avoiding undue heating and friction. Each blade preferably includes an angular rake surface which may terminate in a well-rounded or circular surface so as to discharge chips properly without undue strain or distortion.

By use of this type of tool, it is possible to provide maximum tool life, since the burden on each blade may be relieved by the fact that the work is being operated upon by as many roughing cutters and as many finishing cutters as may be required, or in a single pass of the tool.



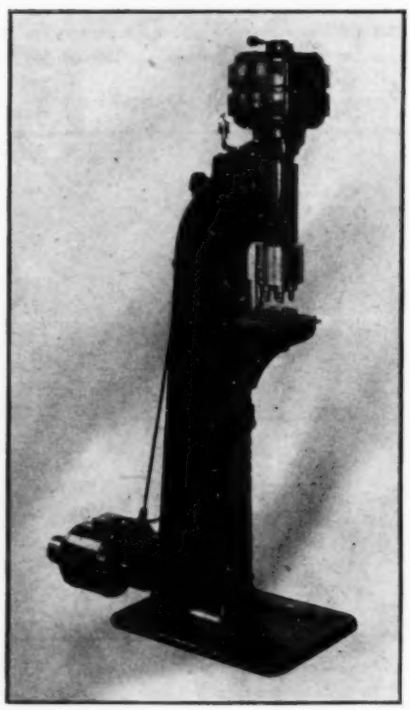
The Internal Tool



The External Tool

Grant No. 120A Rivet Spinning Machine

Equipped with a four-spindle head, driven by a vertical direct-connected motor placed on the top of the machine, the No. 120A noiseless rivet spinning machine, announced by the Grant Manufacturing & Machine Co., Bridgeport, Conn., is set up for spin-



ning heads on four posts in a clock frame simultaneously.

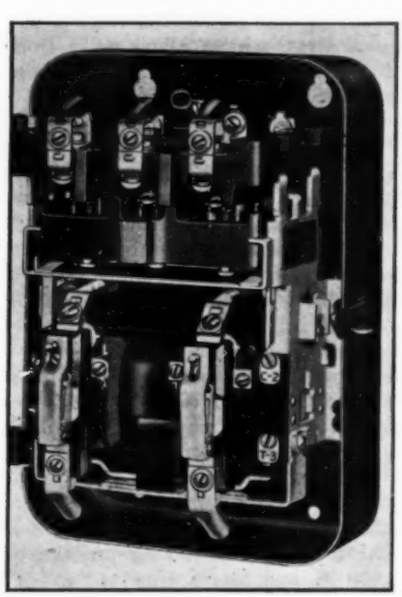
On the table of the machine is mounted a fixture which slides out for easy assembly of the clock frame parts. This fixture with the assembly in place is then pushed back into position for riveting. The operator trips the treadle which automatically clamps the assembly in the proper position and completes the riveting or spinning operation. Less than two seconds is required for the cycle.

The horizontal motor at the rear of the machine furnishes the power for the operation of the automatic clamping mechanism and for bringing the four-spindle head down to perform the riveting operation. This head can be built with two to six spindles, depending upon the diameter of the rivets to be spun, and the center to center distance required. Both motors are operated from the same switch.

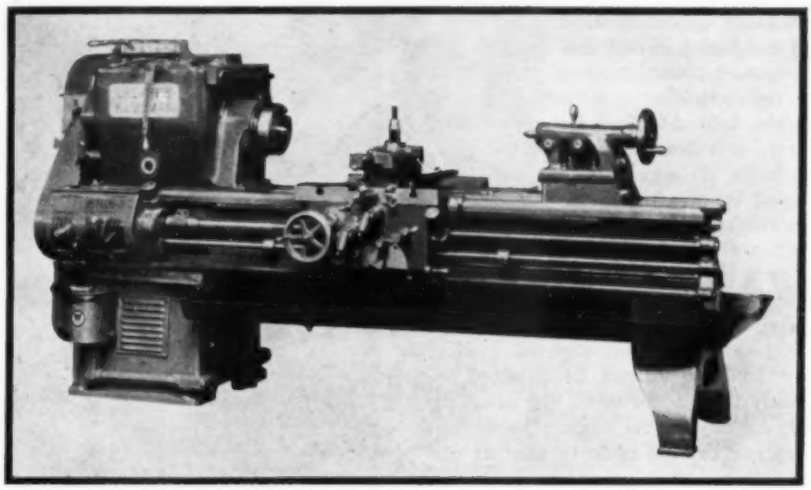
Condit Motor Starter

An across-the-line motor starter for general-purpose installations has been announced by the Condit Electrical Manufacturing Corporation, Boston, Mass. This starter, designated as Type A-32, is rated 25 hp. at 440 and 550 volts, 15 hp. at 220 volts, and 7½ hp. at 110 volts.

A feature of design is a temperature overload relay, designed on the melting alloy principle, in which greater accuracy is obtained by total inclosure of the relay in a molded case. Other features are heavy silver contacts, vertical make and break short-stroke mechanism and multi-break arc-prevention principle.



Greaves-Klusman Geared Head Engine Lathe



Equipped with a bed designed to reduce the twisting and bending strains by means of heavy ribbing which extends the full depth of the bed, the Timken equipped geared head engine lathe announced by the Greaves-Klusman Tool Co., Cincinnati, Ohio, is made in four sizes; 16 in. x 6 ft., 18 in. x 6 ft., 20 in. x 8 ft., and 22 in. x 8 ft. Bed extension is back of the front end to act as a support between headstock and the front cabinet leg, eliminating overhang or loose support brackets.

The rear V is dropped to the level of the front flat, giving additional turning capacity. In this design the tool pressure reacts inside of the front V, even when turning large diameters. This prevents the carriage from buckling, the apron from getting out of alignment and the tool from chattering, which occurs when the tool pressure falls outside of the V.

A new form of nose is used on these machines. The small diameter is ground standard and allows the operator to slip on face plates or chucks easily, relieving him of the strain of supporting their weight while turning the spindle to engage the threads. The threaded diameter, being much larger than the pilot diameter, provides an extra large shoulder area for squaring the face plates.

The arrangement of the gears in the geared head is similar to the sliding gear transmision used in automobiles. In this design one lever disengages the friction clutch, relieving the gearing of all strain, permitting the other two levers to slide gears freely into selected positions for the twelve speeds available.

Power is transmitted to the spindle through gears directly in back of the front spindle bearing. Lubrication is by means of splash oiling, and a pump in the headstock enables the operator to regulate the supply of lubricant.

Drive motor is mounted on a machined plate in the cabinet leg. A flat-belt tightener is attached to cover plate on the end of the leg. Texrope V-belt or chain drives may also be furnished. Longitudinal feed stops in both directions are provided. Openings in cabinet leg ventilate motor.

"M. B." Air Grinder

Monnier Brothers, Inc., Algonac, Mich., has announced a super speed air grinder, developing approximately 100,000 r.p.m., and permitting quick and efficient work. Construction is of aluminum and steel, with the shaft revolving in ball bearings. The grinder is self-cleaning, preventing dust and other abrasives from reaching the bearing surfaces. The device weighs 8½ oz.

Leland-Gifford No. 4 Hydraulic Drilling Machine

Equally applicable to drilling, reaming and facing in cast iron or for heavy production work in steel, the No. 4 hydraulic drilling machine introduced by the Leland-Gifford Co., Worcester, Mass., is a box-column type machine. Both its sliding head and table are guided by and travel on the continuous finished face of the colum, to which both are attached through gibs. Its drive is by electric motor, and its feed is hydraulic.

Rapid approach and return is at the rate of 240 in. per min., while any drilling feed can be obtained instantly from ½ to 20 in. per min. By varying the control stops a jump feed from one drilling cycle to another can be obtained.

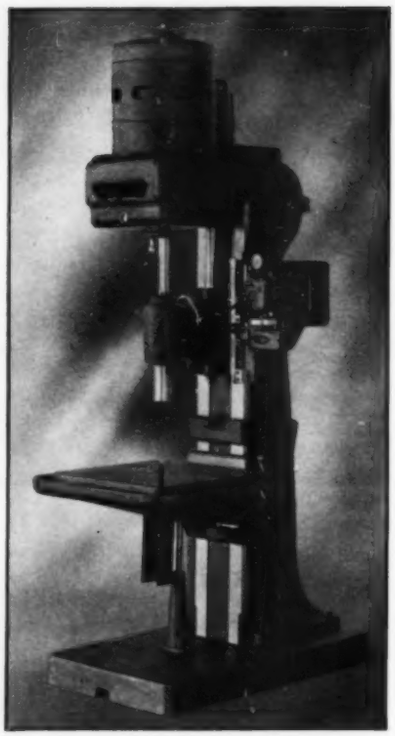
Spot facing is accomplished by feeding against an adjustable positive stop. An overload release prevents injury to the drill or the work. Pressure of the feed can be determined not only for spotfacing but for drilling, and a pressure gage shows the drilling pressure at all times. This visible indicator keeps the operator informed of the variation of material hardness or the condition of the cutting tool.

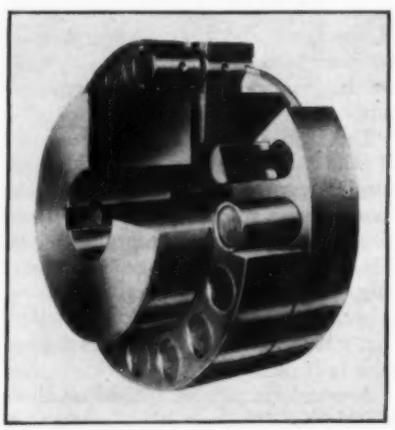
Power for driving the multi-spline spindle is by a four-speed, 5-hp. ball-bearing motor through one of two gear trains, giving eight spindle speeds from 60 to 615 r.p.m. All speeds are quickly obtained through a convenient shift wheel, and a direct-reading indicator plate shows each successive speed, and also the correct drill size for that speed, based on 80 ft. per min. cutting speed. A mechanical electric interlock prevents injury to the gears.

Starting and stopping of the motor is through a pushbutton which controls the motor through a magnetic contactor. All electric wiring and hydraulic piping are inclosed.

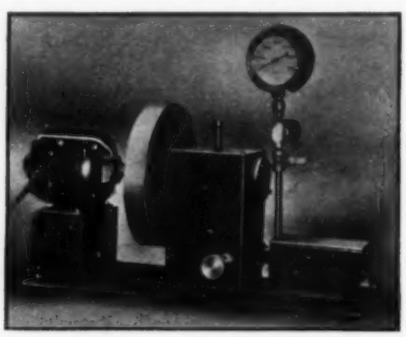
Rate of feed control is always independent of cam settings, and the operator is enabled to control the rate of feed of the machine at all times without disturbing the settings of the cycle.

Specifications of the No. 4 drilling machine are as follows: distance, center of spindle to face of column, 13 in.; maximum distance from spindle to table, 33 in.; vertical movement of sliding head and spindle, 18 in.; vertical movement of table, 13 in.; working surface of table, 24x23 in.; net weight, 3,400 lb.





Coupling flanges are manganese steel



Flywheel smooths out operation

"Francke" Improved Flexible Coupling

Changes have been made in the design and materials of the "Francke" flexible coupling made by the John Waldron Corporation, New Brunswick, N. J. All coupling flanges, except the larger sizes, are now being made of a forged high manganese alloy steel. Larger sizes are molded of semi-steel. Self-lubricating bronze bushings now replace the old style dry bushings. These bushings offer little resistance to end-wise movement of the shafts of the connected machines when under load, because of their self-lubricating feature.

Another improvement is in the design of the cross pins by which the crucible spring steel laminations are held within the keepers. The center portion of the cross pins, which pass through the perforations in the laminations, is now made glass hard. Ends of the cross pins are expanded into the tapered recesses of the keepers, thereby making it impossible for them to become loose.

"Hydro-Motive" Hydraulic Pump

A hydraulic pump employing a flywheel as for a punch press, has been developed by the Hydro-Motive Company, 1001 West Washington Blvd., Chicago, Ill. A direct-connected 1,200-r.p.m. motor drives a crankshaft and flywheel. The crankshaft is mounted in roller bearings, and reciprocates four pistons, 90 deg. apart, and two spool valves 180 deg. apart. Valves and pistons are sealed by piston rings. Normally the fluid is circulated through an idling valve from the crank-housing which is also the reservoir. When the idling valve is in working position, the fluid is conducted through another spool valve with two outlets. This valve is controlled from a pressure-regulating valve so that when fluid reaches a predetermined pressure, the valve is moved automatically and conducts fluid through the second outlet. When the pressure in this outlet reaches a predetermined pressure, the idling valve is automatically moved to the idling position. By use of a flywheel, hydraulic cylinders may be operated at the same speed as crank presses.

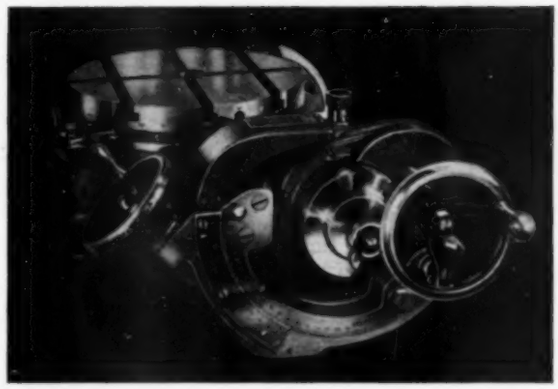
The pump illustrated has ¾-in. diameter pistons with ¾-in. stroke, and a capacity of 5.6 gal. per min. with a maximum working pressure of 5,000 lb. and uses a ⅓-hp. motor.

Pratt & Whitney Tilting Rotary Table

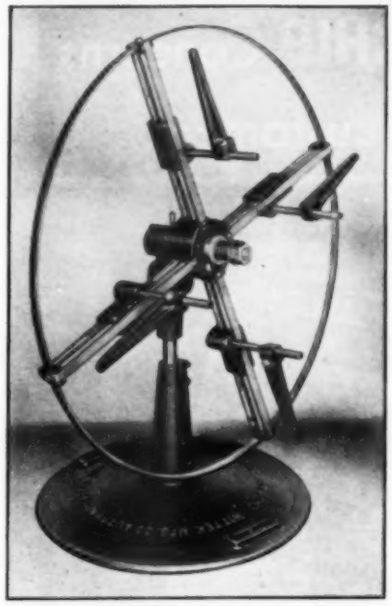
The Pratt & Whitney Co., Hartford, Conn., has placed on the market a 10-in. tilting rotary table designed for use with the Pratt & Whitney No. 1A jig borer. This table is for precision boring of holes at exact angles as well as for boring work of a circular nature which is most easily laid out using polar coordinates. The scraped surface is 10 in. in diameter and contains standard work holding T-slots and an accurate hole in the center for locating work. Outer edge of the table is graduated in degrees for approximate indexing, using a large rapid traverse handwheel. For exact setting a slow motion handwheel is engaged by a clutch knob. The large graduated dial and its vernier make possible accurate indexing to two seconds. A non-influencing binder keeps the rotary movement locked solidly during boring.

The entire table is hinged at one side and can be tilted to any angle from zero to 90 deg. Graduations and a vernier provide for accurate setting to one minute. The tilting movement is locked solidly during boring.

Super-precision ball bearings are used throughout. The table height in a horizontal position is 6⅛ in., and its net weight is approximately 200 lb. It is furnished with a proving bar, a chart, a gage for angular setting and with either hold down straps or T-bolts.



For use on the Pratt & Whitney No. 1A jig borer, this table is designed for precision boring of holes at angles



Wittek Self-Centering Reel for Coil Stock

An automatic self-centering reel for holding coil stock, announced by the Wittek Manufacturing Co., Chicago, Ill., is equipped with four automatically expanding coil holders which slide up or down on the radial arms by means of auxiliary threaded shafts. The shafts are rotated by gears, actuated by rotating the reel to the right or left with the gears in mesh.

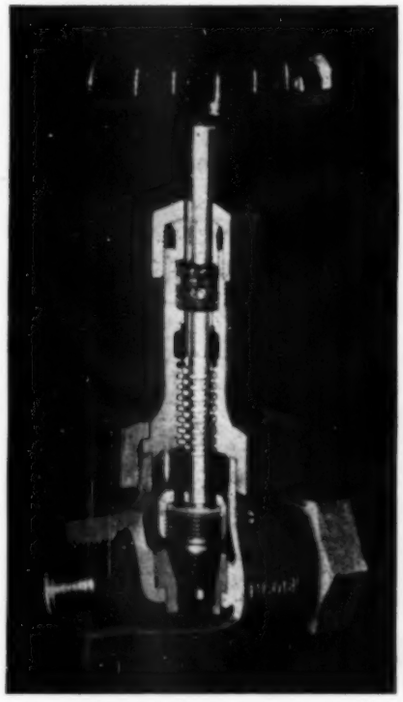
When adjusted to the desired diameter, the gears are disengaged and locked into position by shifting the control lever on the gearbox. Gears are inclosed in a dustproof housing.

Radial arms and threaded shafts are guarded by a hardened rail and supported at their ends by a heavy retaining ring, which also serves to keep the stock from looping over the arms when the reel is inclined. The four coil holders are always equally distant from the center.

Adjustment may be made to any angle from the horizontal, and the reel will hold coils up to 500 lb. in weight and from 9 to 28 in. open center. A heavy base is adjustable for height.

Jessop Stainless-Steel Bar Stock

Developed for use in applications where the surface of the bar must have corrosion and temperature-resistant properties, "Silverbond" stainless steel bar stock, announced by the Jessop Steel Co., Washington, Pa., has a web-like structure of which low carbon inexpensive inserts make up approximately 40 per cent. These inserts are mechanically held, as well as welded by pressure applied at high temperatures, so that there is no possibility of separation of the component parts. Cladding can be varied from 10 to 25 per cent, depending upon the application. The insert of the less costly metal reduces the cost of the bar, and will, in some cases, be an advantage in forming and fabricating due to its added ductility. Stock is made in rounds, flats, octagons, hexagons, sheets, strips and other shapes to meet special requirements of the purchaser.



Hancock Globe Valve

This globe valve, announced by the Hancock Valve Co., 3 Elias St., Bridgeport, Conn., has a number of features which, it is claimed, greatly increase its wearing qualities. These advancements include superhard stainless steel valve disks and seat rings, which prevent wire drawing, steam cutting and galling. The disk is attached to the stem in a way that insures correct seating and facilitates regrinding. Special types of bronze have been developed for the valve stem and bonnet. The design provides tight back seating and permits easy repacking while the valve is in pressure service. Made for steam pressures up to 300 lb.

NEW BOOKS

BUDGETING—*By Prior Sinclair, certified public accountant. 438 pages, 5⅝x8⅜ in. Cloth bound. Indexed and illustrated. Published by the Ronald Press Company, 15 East 26 St., New York, N. Y. Price $5.*

Even those who have made practical use of budgeting and who believe they understand its scope will be amazed at the many ramifications of this means for business control as pictured by the author. Budgeting, as he envisions it, is not an incidental step in accounting but an independent and highly useful tool of management.

Mr. Prior describes in detail fifteen major budgets which encompass every major function of modern business. He tells how these should be constructed, and when put to practical use, how they may be checked against actual performance.

The volume is illustrated by 160 working forms, tables and charts. It comprises a practical manual for the executive who would apply the budget principle to his business or who, having one, seeks to increase its effectiveness.

PROBLEMS IN INDUSTRIAL PURCHASING—*By Howard T. Lewis, professor of Marketing, Harvard University. 498 pages, 5¾x9 in. Cloth bound. Indexed and illustrated. Published by the McGraw-Hill Book Company, 330 West 42 St., New York, N. Y. Price $5.*

Since cost of materials is the largest single outlay of the average manufacturer, the need for effective procurement methods is obvious. Purchasing is a process capable of close control, and its possibilities for savings are far reaching.

Professor Lewis supplements the literature on this subject by a presentation of case studies based on actual experience in various industries. Questions following these brief case histories are designed to provide a basis for discussion.

The point of view taken is that of management rather than that of the purchasing officer. This approach gives a broad viewpoint.

Nine sections into which the volume is divided cover respectively, introduction, nature and organization of purchasing, procedure, control of quality, quantity, source of purchases, price, speculative purchasing, and measurement of performance.

Purchasing forms and organization charts comprise the greater part of the illustrations.

WERKSTOFF - HANDBUCH STAHL UND EISEN—*32 additional pages with five full page charts for the original loose-leaf folder 7x9 in. Published in German by Verlag Stahleisen, Breite Strasse 27, Düsseldorf, Germany. Price RM 5.25.*

These pages—the fourth of a series—are revised and supplementary material to the original book (*AM*—Vol. 70, page 521). Some of the authors have appeared in the first volume, others are new.

Subjects covered include: magnetic properties, non-magnetic steels, boiler steels, steels for deep drawing, vanadium steels, chromium steels, pouring temperatures, hardness, razor steels, pen steels and the hot working of steels.

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Tractor makers, like other modern manufacturers, neglect no opportunity to improve their product or to lower production costs. It is significant therefore that 6 out of 11* leading concerns making tractors use Oakite cleaning materials.
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*6 out of the 11 manufacturers of tractors, rated AAAA in Thomas' Register, use Oakite Materials.

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The Round Table

YEARLY WAGE

"What's the idea of hunting through the old cost records, Al? Has the income tax sleuth been after you?"

"No, Ed. I'm just trying to see how much our labor costs, or our payroll to be more exact, varied during the past few years."

"Think someone has been putting something over on us?"

"Not at all, Ed. I've been reading about some of the larger concerns that have cut out piece work, hourly and weekly rates, and pay men by the year. Just wondering how it would work out with us."

"I've never heard of it, Al, and I don't see how it's possible. How do the companies know how much work they'll have next year? Don't forget we have stockholders as well as employees, Al."

"I'm not likely to forget it, Ed, when you're around to hint about another dividend. You don't think these concerns want to raise their costs any more than we, do you?"

"How can they help it, Al? We don't have to guarantee anything and can cut off our labor cost the minute orders drop off."

"That's the trouble, Ed. None of us live by the hour or the week. We have to eat and pay rent the year round. So do the men in the shop. Steady work that will give the same pay as now is better than double wages for six months and none for the other six."

"It sounds as though you've been reading about security, Al. There's no such animal."

"I know your story. I also know you feel a lot more secure with a fixed yearly income than you did on piece work in the old shop."

"But I don't see how it will work—not in our shop at least. And I'm not sure I like it anyhow."

"Perhaps it won't, Ed. That's what I'm trying to find out. If it can be done, the men would be a lot happier to be sure of so much a year, even if the weekly pay envelope wasn't as fat as it is now—when they get it."

"I'll bet the men would turn it down. They'd rather take a chance and have big money in their pockets once in a while."

"And I'm just as sure they'd work better and feel more as though they 'belonged' if they knew they'd get a pay envelope even if there wasn't any work that week."

"It sounds impractical to me, Al."

"You're like most of us, Ed, I guess; when we don't understand a thing we say it won't work. But when some of the best concerns find that it pays both in contentment and in dividends, you can't turn it off or forget about it so easily.

Is Al right in thinking a yearly wage is sound? Or is it practical for only a few plants?

DISCUSSION

A Fair Price

Some ways of explaining why different quotations on the same job vary so much are: difference in percentages for costs of sales, administration and factory burden; desire of the management to keep a certain type of organization intact; to keep a certain class of machinery in use; prospects of getting later business at a profit; and the desire to make connections with well known concerns.

I have found that poor estimating and faulty accounting are minor causes of a difference in quotations. Some plants recruit their estimators, and to some extent their accountants from the shop. Figures mean something physical and tangible to men of that class. Their shop work and their experience give them a tremendous advantage over the office-trained men. A bidder who has had experience in turning out a similar job can skillfully cut corners and keep costs well in hand.

A real vital factor in the labor part of any job is the class of work done in the various bidder's plants. I once asked for bids for building a small machine. The bids ran from $280 down. One man with idle men and machines took the job for $75 and said he made a few dollars over expenses, and I believed him after seeing the machine. —E. E. Gagnon.

When estimates furnished by different concerns vary as much as they do, it is not because everyone does not figure alike, but because the factors that must be considered when estimating are different for the different manufacturers. In fact I can think of two factors only that should be very nearly the same for all plants, namely, cost of materials and profit.

Operating expenses of one concern

may be much greater than those of another, which may be due to variation in efficiency of management, cost of selling and various other causes. The location of a plant accounts for variations in the cost of labor, transportation, etc. Some concerns specialize in certain classes of work that are produced on special machines by specialists cheaper than by a competitor who does not specialize. Other plants have faulty accounting methods which raise or lower the overhead of one department at the expense of another.

So it is apparent that when estimates vary greatly, it is not always the fault of the estimator, though, of course, being human we are all likely to make mistakes. —NILS H. LOU,
Toolroom Foreman,
Glenn L. Martin Company.

A concern that has had neither the courage nor the foresight to revalue its assets since deflation is carrying its investment on its books at an inflated value. Interest on this inflated value figured in as a portion of the overhead that each job must bear, naturally makes the quoted price on the jobs higher. The concern that has revalued its property will have a pricing advantage over those that have not done so.

A concern having plenty of work is not going to make any particular effort to get more work by attractive pricing. Therefore, a considerable difference in price may mean that one is in immediate need of work and that the other has all the work it can handle.

There is always a difference in pricing due to the relative equipment in competing plants. Plant A may have newer and more modern equipment than plant B and it is out of the question for plant B to compete in pricing with plant A. Again, both plants may be equally equipped, but the equipment of one may be better adapted to certain kinds of work than that of the other. Under such conditions, plant A may underbid plant B on one job this week, and plant B may underbid plant A by about as much on a different job next week. —JOHN E. HYLER.

Share the Wealth

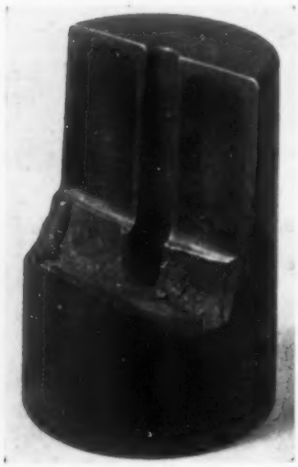
When the title is about wealth and the discussion is about money, it is safe to say that both Al and Ed are wrong. Wealth means valuable goods, and money is merely the receipt for these goods. If we take Henry Ford's money away from him and divide it, his plant will close down. Thousands will lose their jobs and the making of his cars will cease. There is nothing to replace the automobile industry, which has grown because someone has found the money to produce the wealth, called cars.

If there were many small agricultural holdings there would be a demand for many one-man shops, and there would then be plenty of work for skilled, all around craftsmen. But Ford's men do not answer this description and never will.

Back to the land is the only answer to our present problem, but would Al or Ed chuck their shops for hoes? Their discussion is really about money, not wealth. If Ed were to get the Morgan millions, how long would it be before Morgan or Rothschild would take it away from him? If we soak the rich and divide fairly, we would each get an extra dollar and no tobacco.

Al and Ed can make wealth, but millionaires can make money faster than an automatic can make screws.
—M. P. DALTON,
Dublin, Ireland.

RYERSON V. D. STEEL



V.D. Cold Header Bolt Die—3⅜" O.D. Hardened in water at 1520° F. and drawn 600° F. Die produced 74,000 bolts. It was then split open, ground and etched to show uniform hardness penetration.

A Remarkable Water Hardening Steel for

SHEAR BLADES **CHISELS**
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DIES **TAPS, ETC.**

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Ryerson V. D. Steel will get harder—change shape less—and retain a finer grain structure than most other water hardening steels. Its special analysis permits a greater variation in hardening temperatures. Even when overheated as much as 100° it still retains its fine grain structure and toughness.

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Write for V. D. Bulletin 37

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Boston, Detroit, Philadelphia, Cleveland, Cincinnati, Buffalo, Jersey City

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STEEL-SERVICE

TRADE PUBLICATIONS

APPRENTICE TRAINING. The Federal Committee on Apprentice Training Washington, D. C., has published Bulletin No. 1 entitled "What the Federal-State Apprentice Training Program Means to Employers."

BAKELITE. The Synthane Corp., Oaks, Pa., has issued a folder, "Synthane Laminated Bakelite for Mechanical Applications." It contains the essential physical, electrical, chemical and mechanical properties of Synthane.

BELTING. The Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., Passaic, N. J., has issued a bulletin No. 6808-B describing and explaining the details of construction of Condor compensated belt. Charts and diagrams illustrate technical data interesting to users of flat belting.

BRONZE BARS. Data on the uses and properties of various bronze alloys have been collected and published by Joseph T. Ryerson & Son, Inc., Chicago, Ill., as part of a new 26-page booklet on Permite six-foot cast bronze bars.

CONVEYORS. The Standard Conveyor Co., North St. Paul, Minn., has issued three new catalogs: "Conveyors by Standard," "Standard Pneumatic Tube Systems," and "Standard Gravity Roller Conveyors," containing 56 pages of detailed drawings, descriptions and illustrations of rollers, bearings, supports and frames.

CUTTER BLADES. The 48-page catalog No. 51, published by the Ingersoll Milling Machine Co., Hartford, Ill., features the Ingersoll V-lock cutter blade, showing details of its design and application to various types of cutters. It also shows the Ingersoll cone-type of face milling cutters and Ingersoll helical end mills and helical milling cutters. Several pages are devoted to special milling cutters, illustrating and describing many types of angular, combination, radius and form cutters, gang cutters and railroad shop cutters. The milling cutter section is prefaced with a short practical description on the design and use of cutters, cutting angles, speeds and feeds. Data on stellite, cemented carbide cutters and Ingersoll jigs and fixtures are included. The catalog is profusely illustrated both with halftone and blueprint line cuts.

DRILLING MACHINE. The Buffalo Forge Co., Buffalo, N. Y., in bulletin No. 2989, presents the characteristic features of its No. 22 drill.

ELASTIC STOP NUTS. Catalog A-43, published by the Elastic Stop Nut Corporation, Elizabeth, N. J., gives design information on the use of elastic stop nuts. A few typical applications are illustrated. Price lists and dimension tables cover sizes carried in stock.

SHEARS. Catalog S, put out by the Cincinnati Shaper Co., Cincinnati, Ohio, presents the company's line of all-steel shears. The catalog is well illustrated and a dimension sheet is included.

ELECTRICAL EQUIPMENT FOR MACHINE TOOLS. Bulletin GEA-2196, published by the General Electric Co., Schenectady, N. Y., presents "G-E Equipment for Machine Tools." Motors and control equipment as well as recent developments are included.

ELECTRIC LIGHT BULBS. The Waco Data Book answers questions commonly asked about lamp quality, lamp

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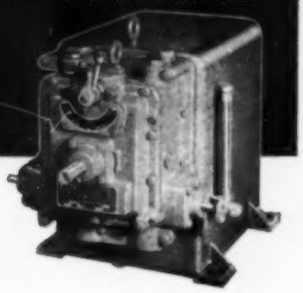

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efficiency, burning life, imported lamps, guarantees, tests and voltage. It illustrates the complete line of Waco electric light bulbs manufactured by the Wabash Appliance Corp., Brooklyn, N. Y.

FIRE AND ACCIDENT PROTECTION APPLIANCES. Underwriters' Laboratories, Inc., have published a supplement to the list of inspected fire and accident protection appliances. New York office and testing station, 109 Leonard St., New York, N. Y.

FLEXIBLE COUPLING. The John Waldron Corp., New Brunswick, N. J., has published a catalog describing and illustrating the important changes which have been made in the "Francke" coupling. It gives complete tables of sizes for the various types.

INDUSTRIAL PRODUCTS. Insulating materials, refractories, floorings, roofings and transite in its various forms are a few of the products described in a catalog of industrial products published by Johns-Manville, 22 East 40th St., New York, N. Y.

KOROSEAL. The B. F. Goodrich Co., Akron, Ohio, has issued a booklet introducing "Koroseal," a synthetic rubber-like material.

LAMINATED PHENOL FIBRE. The Continental-Diamond Fibre Co., Newark, Del., has published a 46-page catalog presenting its line of Dilecto, laminated phenolic materials. It contains illustrations of typical applications and lists of chemical and physical properties.

LUBRICATION. The Alemite Corp., Chicago, Ill., has prepared a lubrication equipment manual. There are 54 pages, with a tab index for each type of Alemite fitting, gun and hose, and for the various accessories.

MAINTENANCE MATERIALS. The Stonhard Co., 401 N. Broad St., Philadelphia, Pa., has issued a guide to successful methods of keeping floors, roofs, walls and foundations in good repair. It is an attractive 24-page booklet, profusely illustrated.

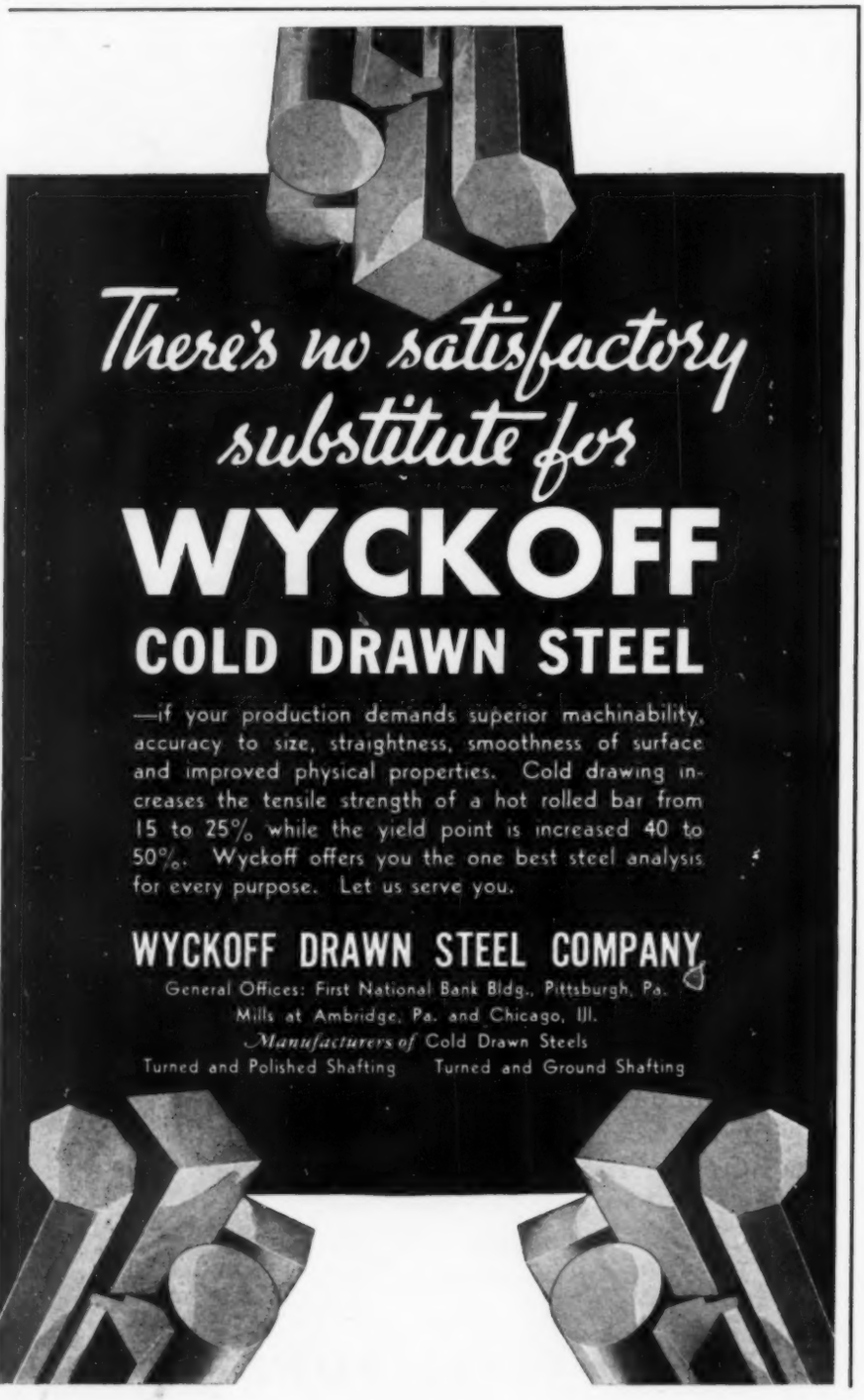
MOTORS AND ELECTRICAL SPECIALTIES. The Ideal Commutator Dresser Co., Sycamore, Ill., has revised its catalog and reference book on commutator and slip ring motor and general electrical maintenance.

NEEDLE ROLLER BEARINGS. "Norma-Hoffmann Precision Needle Roller Bearings" is the title of a bulletin issued by the Norma-Hoffmann Bearings Corporation, Stamford, Conn., describing the latest addition to this manufacturer's line.

RUBBER COATING MATERIALS. A folder put out by the Thiokol Corporation, Yardville, N. J., discusses "Thiokol" synthetic rubber coating materials.

SPEED CONTROL. The Reeves Pulley Co., Columbus, Ind., has issued a speed control handbook, giving information on modern methods of variable speed control for industrial machines. This 112-page, cloth-bound book describes and illustrates in detail the variable speed transmission and Vari-Speed motor pulley.

TRADE ASSOCIATIONS. A bulletin, "Code-Sponsoring Trade Associations," has been prepared by the Department of Commerce, Bureau of Foreign and Domestic Commerce. The bulletin gives a complete list of code authorities and sponsoring trade associations and gives the secretary. It can be obtained from the Superintendent of Documents, Washington, D. C., for 10 cents.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